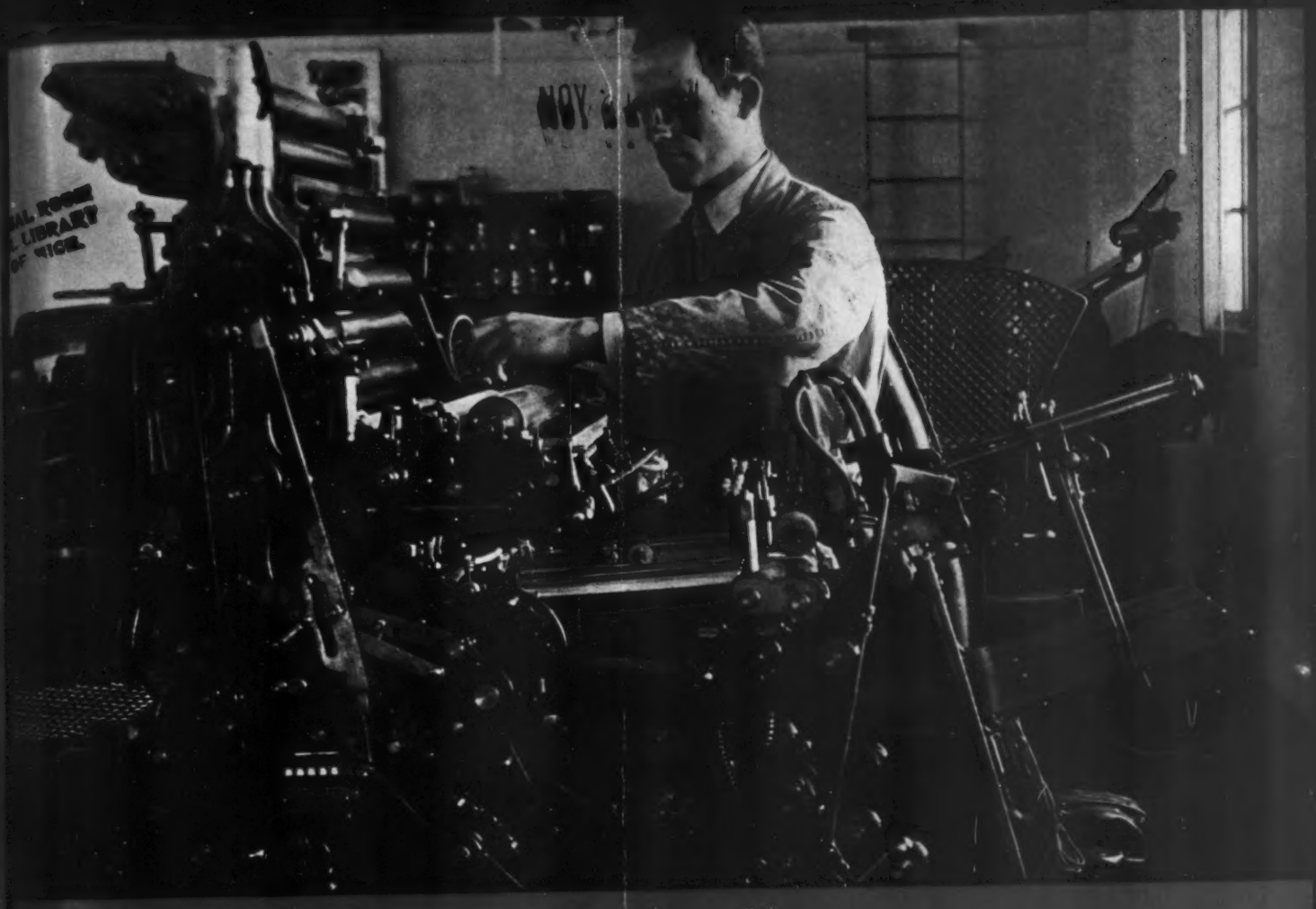

ECEMBER, 1941 PRE-CONVENTION NUMBER

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

VICTIM OF ENVIRONMENT

If you want to see the hidden drama of life, take young goldfish from the same hatching and place some in a goldfish bowl and some in a pond.

Those in the bowl will not grow over a puny four inches. Those in the pond will achieve a giant eight or ten inches of length, sturdy, vigorous, full of fight.

This is a sample of what environment does to all living creatures . . . during their formative years. It can either stunt the growth, hold the individual down to a mediocre level, or free him for unlimited achievement.

Wise educators know this. They know that the young human mind and spirit are plastic to a degree not ordinarily recognized. There's not a great deal of difference between the talent possessed by one boy and the ability possessed by another. The will to win slumbers in the heart of every mother's son. It's the influences that are brought to bear on these youngsters that spell the *great* difference between achievement and failure in the years to come.

That is why educators who are truly worthy of the name go beyond the routine of "instruction" and seek to surround their students with the influences that fan into flame the spark of achievement. That is why exceptional instructors in mechanical drawing urge the use of fine quality drawing instruments. For, *chosen with care,* these instruments in the act of truly creative work can open up a new realm in the imagination of a youngster. They set a goal, and they show the way in which it is achieved. They initiate a boy into the discipline which is so essential a part of achievement. They train him in sensitive craftsmanship, in higher ideals and aims. They can even stimulate his ambition and lift his ability. Their slightly higher cost, when compared with their value and their use, is as nothing in this important work, the making of a man.

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The demand for Dietzgen Drawing Instruments today greatly exceeds the present available supply. First, the national defense requirements are making a tremendous demand on our production capacity. Second, the critical materials used in making Dietzgen quality instruments impose a drastic limitation on production for other than defense needs. Your tolerant understanding of this situation is appreciated.

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EVERYTHING FOR DRAFTING AND SURVEYING

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

VOL. 30 DECEMBER, 1941 Number 10

BOSTON— THE CONVENTION CITY

Be sure to read Edward C. Emerson's splendid article on Boston's school system, and its fine record in the fields of industrial arts and vocational education.

This city really has much to offer to the convention visitors. From the very start, it had a clear vision of the place industrial arts and vocational education should occupy in the school curriculum. Boston has faithfully lived up to its earlier convictions, and it will be worth while to see how much progress has been made throughout the years.

Then, too, Boston possesses great historic interest to all Americans. It not only is a great metropolis, but it also is the capitol of its state. Then there is the Boston Common, Faneuil Hall, the Old State House, the Old North Church, Old South Meeting House, Paul Revere's house, Bunker Hill Monument, and the like, for visitors to visit and enjoy.

Boston and the convention have much to offer. Prepare to attend the 1941 meeting of the American Vocational Association.

The Annual Index

The reader's attention is called to the annual index which follows page 432 in this issue. It has been placed at the center of the magazine so that it may be removed easily when the monthly issues are to be bound into one volume.

A Suggestion for 1942

Send news notes of a general or personal nature, also about the meetings of your local and state industrial arts and vocational education groups to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. We will gladly publish this type of news. It will keep your friends posted about what you, your school, and your teacher's organizations are doing.

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Short Talks on Wood

RED OAK (*Quercus borealis*)

Considered the true red oak. Commercially it is the most important of all "red oaks" — a group which includes almost a dozen species. The wood is heavy, hard and strong. Rather coarse-grained. Its properties are quite similar to those of white oak except that it is less durable, and its open pores permit the passage of liquids more readily. Reddish-brown in color. Has an attractive grain.

Consumed in large quantities for furniture, flooring, sash, doors, interior finish, cooperage, railway ties (when treated with preservative), ship building and construction timbers.

Most generally found from Maine to Minnesota and south to Florida and Texas. Makes its best growth on rich, moist, porous soil along streams or in deep woodlands. One of the most rapid growing oaks.

A fairly large tree. Usually attains a height of 70-80 feet, but may reach 150 feet. Trunk diameter about 2-3 feet, sometimes larger. In the forest it is tall and straight with a clear trunk and a rather narrow, rounded crown. An excellent ornamental.

The bark on older trees is dark gray or nearly black, and is divided into rounded ridges. Leaves are simple, alternate, 5-9 inches long, and 4-6 inches wide. Usually have from 7-9 lobes which are bristle-tipped. Dull, dark green above; yellow-green below. Fruit is an acorn about ¾ to 1¾ inches long, blunt-topped and flat at base. Matures the second year.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Boston and the American Vocational Association Convention

EDWARD C. EMERSON*

Boston — to most of us that brings up mental pictures of Bunker Hill, the Boston Tea Party, the Common where the cows used to graze, the Frog Pond, General Gage and the boys, Holmes, Lowell, Longfellow, Emerson, a host of others, and Horace Mann. It means the first public school, the first college, and many other events and places of historical, literary, and educational interest.

The first organized trade instruction in Boston was given under the auspices of the Massachusetts Charitable Mechanics Association, which was founded with Paul Revere as the first president in 1795, "for the benefit of all young men of a mechanical turn of mind." This association gave trade instruction over a period of 121 years, during which time courses were given in carpentry, masonry and tile setting, plumbing, sheet-metal work, pattern drafting, and architectural drafting.

This city has seen the beginnings of many educational changes of great national importance, so it is a fitting place for a national education meeting. Boston is proud to be the host of the American Vocational Association, for it is the capitol of Massachusetts where Charles R. Allen, and now Robert O. Small, have made vocational educational history.

Drawing was started in the Boston schools as early as 1827, sewing for girls in 1853, shopwork for boys below the secondary school in 1882, cooking in 1885, prevocational classes in 1911. It was a pioneer city. The Mechanic Arts High School was established in 1893. The Trade School for Girls was established in 1909. This school was founded under private auspices, the National Association of Women Workers, in 1904. The Douglas Commission (1905–1908), investigating the need for industrial schools, found a working model at hand.

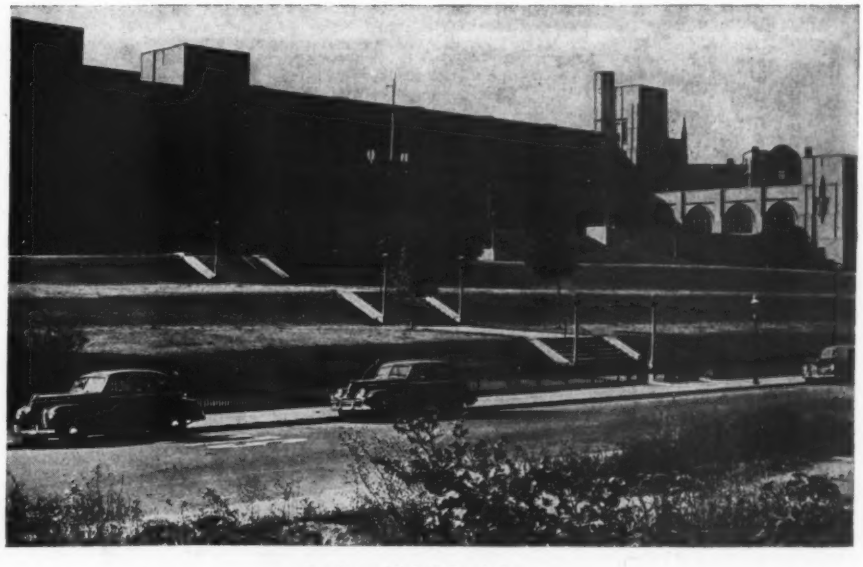
Boston Trade School was established in 1912 following an experiment of a pre-apprentice school which was established in December, 1909. Cooperative courses in general high schools began in 1913.

Here was the home of the Boston Sloyd Training School, established by Mrs. Quincy Agassiz Shaw under Gustaf Larsson and Josef Sandberg. This school later became the Training School for Teachers of Mechanic Arts, a part of the Boston school system, under Mr. Sandberg, who when he retires on August 31, 1942, will have given 52 years of uninterrupted service in training shop teachers. Boston trains its industrial-arts teachers.

Boston was the first to show by actual experiment — the Agassiz Experiment in 1907 — that additional shop time increased rather than decreased a pupil's academic interests and attainments.

On the straight course of educational advancement our "tacks" have been short and conservative, but progress has been steady and we have seldom been obliged to "back our sails."

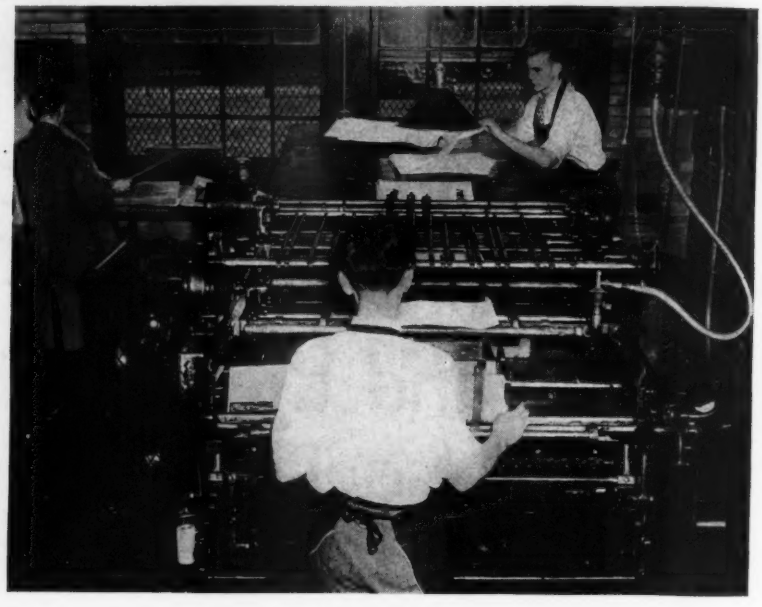
The teaching of handwork begins with all pupils in grade 1 and continues as a required subject through grade 7. Opportunities for intensive elective courses are given from grade 7 through 12. The first three grades are supervised by the fine-arts department. Beginning with the fourth grade, most of the work of the girls is directed by the Department of Household Science and Arts and that of the boys by the mechanic-arts division of the Department of Manual Arts. Sewing is taught to the girls in grades 4, 5, and 6; cooking and homemaking in grades 7, 8, and 9. For boys, instruction begins with grade 4 in cardboard, and is continued through



Brighton High School, Boston

*Associate Director of Mechanic Arts, Boston, Mass.

Linotype operation

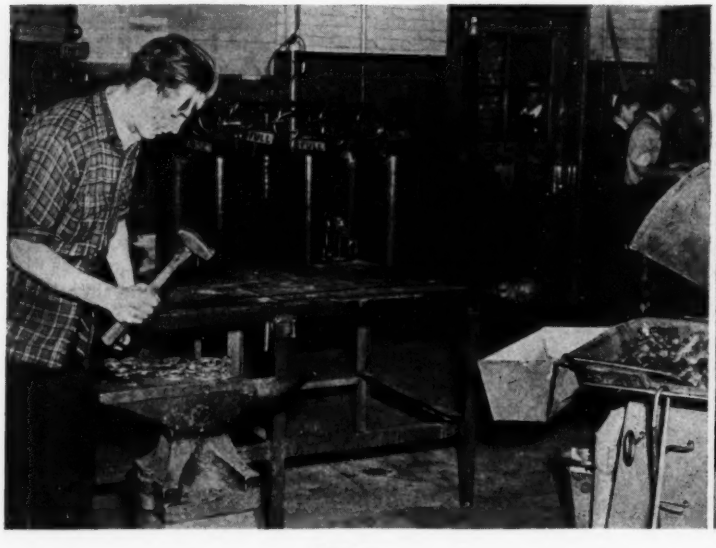


Presswork

grade 5 in bookbinding, taught by the grade teachers under supervision. Clay modeling is given in "all boys' " schools by a special teacher, in addition to bookbinding. Beginning with grade 6, all boys go to shop under special instructors. In grades 6 to 9, instruction is in woodworking, sheet metal, printing, electrical work, with a few shops in machine-shop practice, painting, and auto mechanics. We have a few general shops. The classes rotate through the shops on a two-semester principle. Industrial arts is carried as an elective in grades 7 through 12 with a time allotment of from 360–440 minutes a week.

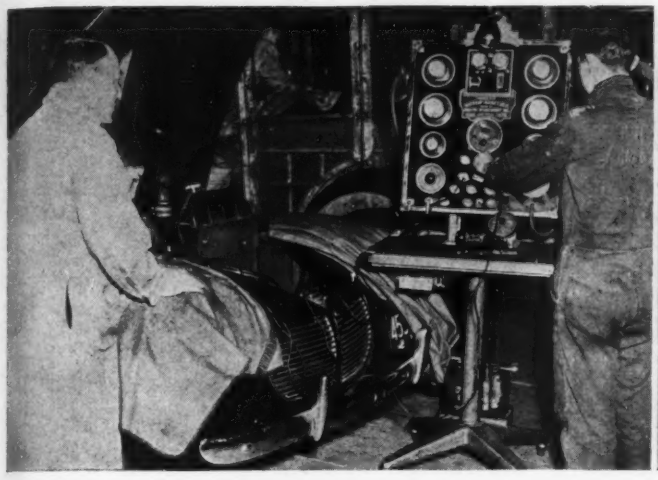
Of the 23 secondary schools in Boston, all but five offer handwork courses; 11 offer vocational courses. Two high schools, the Mechanic Arts High School for Boys, and the High School of Practical Arts for Girls, offer technical or household-arts courses. Mechanic Arts High teaches no trade as such, but the High School of Practical Arts has courses in household arts including the domestic arts, dressmaking and millinery, as a major, and art as a minor; and special art as a major with the household arts as minors; all are state aided. Trade instruction is given in cooperative courses in general high schools; in auto mechanics, cabinetmaking, electricity, radio service, auto bodywork, welding, upholstery, and printing (including composition, presswork, linotype and monotype operation). In the Boston Trade School, instruction is given in airplane service, automobile mechanics, cabinetmaking, carpentry, drafting, electrical work, machine-shop work, masonry, painting and decorating, plumbing, printing, radio service, sheet-metal work, welding, and forging. In the Trade School for Girls courses are given in the needle trades through training in dressmaking, tailoring, fur work, dress design, patternmaking, embroidery, ornament making, millinery, power stitching, and scientific care of the hair and skin.

The most recent vocational school in Boston is the Vocational High and Opportunity School, established in 1939. The organization of this school is for both boys and girls, on the "general trade" course plan. The subjects for girls are: typing, shorthand, business training and practice, office practice, dressmaking, cookery, power-machine operating, millinery, clothing and fabrics. The subjects for boys are: business training and practice, printing, machine-shop work, electricity, woodwork-



Forging

Welding



Motor tuning and testing

Auto bodywork

ing, cabinetmaking and carpentry, factory training, and auto mechanics.

In addition to these vocational schools there is a very flourishing vocational agricultural course in the Jamaica Plain High School.

While in the past few years there has been a decided drop in school population, our shop and vocational courses have shown a decided increase. All of our courses are filled to capacity, and some schools are running on a two-platoon plan.

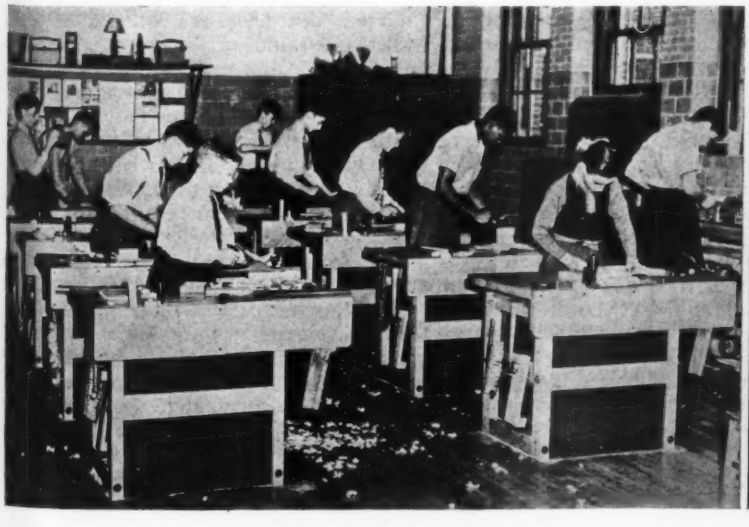
Our placements have been high. The State Department of Education report shows that over a period of 10 years (the depression period), Boston has a record in all trade courses of 70.5 per cent placement of boys and 74 per cent placement of girls. The last state report available, graduates of June, 1940, shows 82 per cent for boys, 92 per cent for girls. At present we are approaching 100 per cent.

The Boston Evening Trade School, organized under the Department of Evening Schools, operates courses in different parts of the city where equipment is available, in trade courses for which there is a demand. These courses are open, under the Smith-Hughes law, only to those persons who are employed in industry in the trade for which they apply for admission.

This year machinists and welders who are definitely employed in these trades, who have been regularly attending the evening trade classes, are enrolled in the National Defense Training classes as part of the "upgrading in industry" plan. During the school year, classes of apprentices and journeymen duly registered with trade-unions, are conducted. The unions cooperating are sheet metal, cement finishers, electrical workers, ornamental ironworkers, plumbers, and printers (composition and linotype workers). Much of this work is supplemented with related work such as blueprint reading, industrial sketching, and related mathematics. We have found the unions most cooperative and enthusiastic.

Classes in National Defense Training started on July 15, 1940, and have been continuous ever since. The schools are cooperating with the Boston Navy Yard in a course of 44 weeks' instruction in machine shop, on the basis of 40 hours per week, in addition to four-hour periods on Saturday mornings of related work in applied mathematics, metallurgy, blueprint reading and industrial sketching, and physics. In addition to these classes there is a similar setup for trainees sent to us by the WPA and the Massachusetts State Employment Service, on a 50-50 basis. These men have a program calling for 480 hours of instruction after which, if successful, they are eligible for placement. All trainees from the WPA and the State Employment Service are required to have a medical examination and an aptitude test.

The men from the Navy Yard work on projects for that Yard, and Yard inspectors are constantly in attendance. They go from these courses directly into the Yard shops. All of these men are selected from civil-service lists by the Navy Yard authorities. Supplementary courses are given for the Navy Yard workers in machine-shop practice and related work, in coppersmithing, plumbing, pipe fitting, elementary and ad-



Intermediate (Junior High) School

Intermediate (Junior High) School

vanced electrical work, and sheet metal. Courses in light and heavy metalwork and ship nomenclature have also been carried on for the Navy Yard men.

Courses in airplane engines, airplane structure, and radio operation in connection with the East Boston airport, and airplane rigging and airplane engine work for the U. S. Naval Air Base at Squantum, Mass., have been organized for enlisted men. Such classes are periodic.

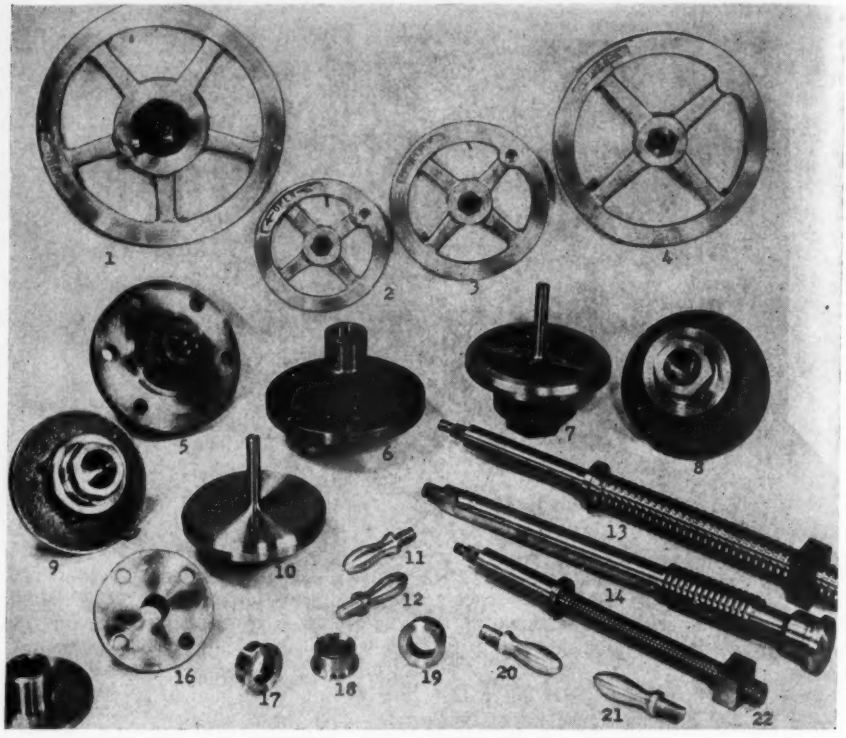
At the request of the U. S. Ordnance Division we are giving instruction for inspectors of ordnance to those persons who have passed the necessary civil-service test. We are also cooperating with one firm having government contracts for ordnance for the training of 50 men inspectors and 30 women inspectors. A large percentage of these have already been trained and are being employed.

We are cooperating with the NYA in shop courses, and in courses for elementary and advanced shorthand, elementary and advanced typing, business machines, business mathematics, window dressing, retail law, retail selling, code sending and receiving work, and hospital aids. This work is rapidly expanding.

The problem of securing qualified instructors for all these courses is not a small one. Only men or women approved by the state may be employed, and the state's standards are as high as any in the nation. Our instructors, therefore, are fully qualified for the tasks that they are given.

Placement of trainees is an important factor; in fact, it is an essential test of the efficiency of instruction. Taking into consideration the fact that the Boston area still has many firms who have not been awarded government contracts, the placement results are very gratifying, and a much greater degree of success is anticipated with the increase of government contracts. Due to the National Defense Training work we have many school buildings that run far into the night and a substantial number in which the doors are never closed, summer or winter, except on Saturdays and Sundays.

Boston carries on.



Productive work turned out by the Boston Navy Yard machinist-helper trainees under the Navy Yard supervision. This instruction was started on July 15, 1940 in the Boston vocational schools, and is a part of the national defense training program

Technical and Trade Education*

HOMER J. SMITH**

Two Services

The two phases of industrial education — namely, industrial arts and trade training — are indispensable parts of one undertaking. One of them cannot approach perfection so surely alone as it can through the recognition or the aid of the other. One introduces, represents, and explains industrial life; the other trains for, upgrades in, and adjusts to such life. For a person who experiences both in the usual order there is first, acquaintance, then, self-expression. A little later, there comes experience with the elementary processes and conditions of several employment fields. Next, opportunity is afforded for deeper delving of a technical kind in the realm of a reasonable choice. Finally, as the work career unfolds, the need for refreshment or complete change may be satisfied. Who can say when or where industrial arts has been sharply interrupted, giving place to trade education?

Some teachers and special supervisors work wholly in one or the other of these phases. Many other teachers and supervisors, as well as many professors, are active in both and the ratio of such dual-phase positions is increasing. When we examine parallel lists of aims for these phases we note duplication. By reason of identical elements and assumed outcomes the two cannot be mutually exclusive; there is a logical and irreducible fusion of the two. The line of demarcation between them in the experience of a pupil and in the conduct of a school or system becomes gradually indistinct.

Trade instructors are assumed to begin where their industrial-arts colleagues left off but they cannot find the place. Pupils approach them with interests developed, with decisions partially or fully made, and with worth-while training well under way. The two types of teachers now work side by side in our best high schools and junior colleges and in our more progressive trade schools of preparatory type. While the usual secondary schools have been adding to their programs some strictly vocational courses, some of the trade schools have been inaugurating general-shop offerings and tryout periods of varied inclusion. And we may hope that more and more teachers, local administrators, state department officials, and federal aid-and-audit representatives will come to see the service as a whole. There should be more consideration of pupil needs and less fuss about classifications, regulations, reimbursements, and the like.

*Here shown through the courteous permission of the "Proceedings" of the Tenth Annual Conference of Administrative Officers of Public and Private Schools, and of the University of Chicago Press.

**Professor of Industrial Education, University of Minnesota, Minneapolis, Minn. Also vice-president of the American Vocational Association, representing Industrial-Arts Education.

Industrial arts is a function of general education, yet it is a supporting element in specific preparation; indeed, it is the mutual and reciprocating partner of trade and technical work. Vocational education really means getting people ready and keeping them ready for useful employment. Any curriculum area or any course that contributes to these ends is, in a measure, vocational education. It is not necessary to belabor this point, but this concept of unity is more important than any details later to be offered in this article. Some comparisons will serve to clarify both difference and likeness.

Difference and Unity

In industrial arts we work chiefly for deferred values, while in trade training we seek more immediate returns. We check in the latter case by the use of more tangible criteria of goodness. We are interested in the ease of a pupil's gaining and holding employment, in the possibility of his promotion, in his satisfaction with his work, and in his social as well as his economic adequacy. These two viewpoints, as to deferred and immediate values, are both worthy and they are not inconsistent.

In industrial-arts situations we accept all comers and take what steps we may to increase departmental enrollment. The good trade-training program does not wait for pupils to come; the procedure there is to locate those who need assistance. Industrial-arts enrollees are not necessarily selected. These classes rather commonly include all boys and many girls from certain grades and the total number slopes off by election after the compulsory span. We strive always for a better cross section, if not for 100 per cent enrollment of each pupil for at least brief contact, upon the assumption of a contribution so unique that it should be denied to none. Trade training, however, is properly limited on the bases of fitness, need, and employment quotas.

In industrial arts we have become accustomed to stated times of enrollment. The tendency in trade training is toward unit organization in which brief courses of many kinds are continuously made available. Good trade education gives people what they need when they are most in need of it. A vocational program that operates under close prediction of courses to be needed or individuals to be served in a given year is too stabilized and regular to be truly effective.

Industrial arts can attain satisfactory results with rather constant methods and schemes of management because classes are rather homogeneous. A trade program presents more difficult class situations. The variables of age, intelligence, grade completed, interest, work experience, aptitude, attitude, and the like are always confounding. This fact suggests more care in the selection of craftsmen to be made ready for vocational teaching and it suggests longer periods and higher standards of such preparation. It is no longer necessary that we accept men and women of very meager educational contact for our most difficult teaching positions. Defense training plans and activities now in vogue will augment our difficulties as we return to normal teacher certification just as they will present problems later in the realms of industrial employment and worker organization.

An industrial-arts program may be relatively self-contained, being under no powerful obligation to cooperate with agencies outside the schools. A trade-training program that attempts to be self-contained will fail. It must maintain continual closeness to other agencies of many kinds and for many reasons, because the whole concept is one of cooperation.

In industrial-arts work we employ a somewhat standard set of industrial fields in representation. A trade-training program cannot serve community, state, and nation in this restricted and formal way. It must match community type, differ from place to place, and change from time to time.

Industrial arts may use rather standard operations, knowledges, projects, and problems. In trade training there must be some, and often much, of commercial or production work and constant change of learning and drilling jobs.

Industrial-arts work in a school permits a permanent teacher or corps, each one sufficiently prepared to present the elements of several fields. In trade training the separate offerings, and even parts thereof, demand instructors particularly and deeply qualified. For evening work it is often necessary to develop a call-staff in order that new and special units may be practically presented.

In industrial-arts work when pupils graduate or withdraw we tend to lose contact with all except the encouraging few. A trade-training program is incomplete without facilities for placing, following upgrading, and adjusting the enrollees.

In the one phase we assume a mobile population while in the other we pay more attention to matching local need — in the one we stress knowledges and appreciations while in the other we concentrate on skills and attitudes likely to warrant first and continuing employment — in the one we offer trials for exploration while in the other we insist upon correct doing and then upon repetition for accuracy and speed.

These comparisons have been made at the risk of repetition. They have been made not only to indicate differences but to disclose the fact that it is plan and procedure that make a course strongly general, or strongly vocational. Therefore, even in a discussion of trade and technical education, the usual, general, manipulative courses may not be overlooked. Indeed, industrial arts may yet provide a solution for some of our most vexing economic and social problems. This general program helps to keep youth in school and satisfied to remain out of the earning market. It improves acceptance of the regular drill and civic subjects. It is informative, explanatory, and exploratory. It is a highly regarded selective medium or agent. Certainly, it makes specific preparation easier and later upgrading more convenient. Of itself and without its partner, it offers to numberless youth the best possible preparation for countless minor jobs. Conceivably, it provides for millions of future semi-skilled craftsmen, a readiness and adaptability that will serve them well. As long as versatility aids in placement, as long as promotion means change of work, as long as materials and machines and processes and products continue in constant flux, the broad industrial-arts courses must neither be dropped nor discounted. It is time that we listed industrial preparation among our general aims. Industrial arts *is* preparation for industry except in a few basic, time-honored, aristocratic trades and a few specialties that continue to appear.

Cosmopolitan Programs

Despite considerable acquaintance with defense training plans over the nation, and real closeness to such activities in one state, the writer prefers to make only casual reference to these. There is a long-time as well as an immediate defense training program for industry and the former must be deemed the more important. Our lack of eagerness, through the years, to perfect the continuing program has partially precipitated and greatly increased our present difficulty. Weekly or monthly comparison of defense placements with the recent, narrow, yet adequate preparations of groups of workers would seem to indicate that we have long done better than we thought and better than we are daily being told. It is just as apparent that our experience, facilities, and organization have proved valuable as that there is real necessity for speed propaganda.

Our public school system has been organized by levels or types of schools or units, the whole comprising a formal ladder with supplementary or complementary institutions along the way. In the industrial-education area, we have been slow to make clear and distinctive the contributions of these different divisions and provisions. Our several institutions — elementary, junior high, senior high, junior college, day preparatory trade, part time, evening, etc. — would not have different designations if the work within them were graded merely as to advancement. Without varied purposes and assumed products it would suffice if they were numbered or lettered for convenient recording and reporting. The offerings and activities of these successive and lateral units should be not only more exacting as the student ages rise; they should be rather fundamentally different; they should be in keeping with the strict purposes of the units in which they find place. Industrial teachers should be selected and assigned according

to school aims and student maturity rather than according to degrees, trade work or teaching years, special certifications, and the like. An industrial teacher's effectiveness is largely conditioned by the type of students that he understands, the objectives in which he finds most interest, and the standards that he considers acceptable on student performance. Large numbers of our industrial instructors would need to be reassigned if this pattern were to be adopted.

In the elementary six-grade school we have no need for the industrial shop and the specialized industrial teacher. Certain allied arrangements have, however, been made and found effective. There is no thought that trade and technical education should even begin at this level. Here students may learn the rudiments of work life and work relationships. They may gain notions of service and gain an understanding of the interdependence of men and of employments. It will suffice if those completing the sixth grade know that industry is important, that it is greatly diversified, that men work so that they and others may live, and that later each one of them must be ready to meet his chosen tasks. Broader social cooperativeness, better consumer appreciation, and better work attitudes are ends appropriate and possible of attainment at this early age.

In the junior high school, or during the corresponding years, we again avoid all direct efforts toward vocational preparation. These boys and girls we inform and encourage and seek to interest. We orient them through the introduction of more detail and through planned experience with additional media, equipments, and processes. Special industrial teachers are engaged to represent and sample work types or areas. Courses are selected, and content organized, to present the sources, transportation, fabrication, working properties, and ultimate uses of the many materials employed. The chief aims are: improved hand-eye-mind co-ordination, industrial insight, and a start in the direction of occupational choice. If we attempt to train specifically, if we even give strong consideration to community type as offerings are determined, we tend to forsake the major purposes of these intermediate schools. There is preference in the junior high school for six subjects, each a semester in length, the same for all schools, each a constant for every pupil but with no sequences established, each as broad as its title will permit, and presented with the pupil's concept of need rather wholly ignored. This is the place in the complete school setting where well and specifically prepared teachers maintain a really exploratory association with their youthful friends. What an attractive assignment and what a challenge for the teacher who can think and feel "exploration" rather than "preparation." Here many pupils during three years will have decided to drop consideration of industrial earning, many others will have become strongly attracted to the same, and some few will have earned nomination for avenues to service in certain special employments.

For the senior high school period, it seems advisable that departments offer longer lists or broader sets of courses than are now common. There should be more possibility and more permission of choices as well as more intensity of treatments. We look upon the senior high school as a preparatory institution. Some pupils at this stage need preparation for college and university while a greater number of them need preparation for rather immediate entrance to a working world. A considerable percentage of these latter are certain to begin a work-life that is industrial. Some high school pupils may well pursue some industrial courses throughout their full stay, beginning with scatter or extension, and closing with intensive effort in one selected field. Some individuals or groups may well be excused. Others should enroll for such industrial courses as will best support their college and professional intentions. Certain courses should afford entrance to and help in curriculums on engineering, dentistry, industrial-arts teaching, and the like. Others should be based upon local industries, should be truly vocational in character, and should lead to service within the home community if this be desired. We may call these varied courses industrial arts or trade training as we prefer; the name or classification cannot change the fact of need on the part of pupils or of responsibility on the part of districts. There must be increased provision for trade-preparatory courses in the cosmopolitan, coeducational secondary schools. No other institutions can serve the necessary number nor meet so fully the other requirements for the individual and for society. No other institutions will come to be sufficiently acceptable to the young people and to their parents. The more strictly vocational arrangements that can be made, involving the use of regular Smith-Hughes and George-Deen funds, the more nearly we shall approach fulfillment of the American ideal of secondary education.

Election vs. Compulsion

At this level the suggestion is for election rather than compulsion and rigid program control. Each pupil, fortified by competent advice, would elect whether he would pursue any industrial subjects, what ones if any, when, how long, in scatter or intensity, and the like. The teachers would be of two kinds, those institutionally prepared and those possessing trade background but less of educational credit. Fifty per cent of the diploma requirement would be permissible in industrial subjects or in a combination of the so-called practical areas. Cooperative half-time arrangements would be added and integrated. Supervised correspondence instruction would be employed for breadth. There would be a revision of period length. There would be opportunity for young and old to return evenings for high school credit. There would be a vice-principal or department head, worthy to be held responsible. There would be more superintendents and principals availing themselves of basic courses to aid them in administration and supervision.

In the junior colleges, now so frequently added to and correlated with local high school programs, the recommendations just made would apply with at least equal force. It is not educationally, socially, nor economically sound to restrict preparation for industrial pursuits to special schools and to urban centers. Vocational preparation must be afforded geographic scatter by every means that we can devise. The demand for training is unbelievably great, even in normal times, and it is unbelievably diversified. The opportunity for creative administrative thinking about the types and amounts of trade and technical education necessary to be dispensed is almost limitless. Our laws have largely dammed the flow of skilled mechanics from over the seas. Our own fully experienced men are retiring because of age. Apprenticeship, while on the increase, has lagged woefully as a means or source of competent recruits. There is and will be a distressing shortage of genuinely skilled and dependable workmen. It is probable that our relations, after the present war, will be less good with European nations and more cooperative with those of the Central and South American countries. It seems more likely then that we will lose trained people to these southern neighbors rather than receive some from them. Moreover, such men and women as we might induce to come would be more representative of the arts and crafts than of the basic trades.

In some way, and I think partially through improved junior colleges, we must plan to overcome this perplexing shortage. Vocational preparation must be made more freely available to our young people. It must be made more conveniently available so that there may be realness and timing and supply control in the process. Junior colleges, generally, have felt that they couldn't or shouldn't help on this problem but we now meet rather a can-and-will response. The junior college has a responsibility that has not been sensed in worthy measure. In view of its primary function it is unfortunate in its name; its work has been inhibited and circumscribed by the adjective "junior." This institution should serve largely in terminal pattern for the young people and for many of their parents. Rather than to think in terms of preprofessional courses leading to additional years elsewhere, junior colleges should concentrate upon now-or-soon offerings under full-time training plans or through greatly varied cooperative half-time agreements. Rather than to cling to the expression "semi-

professional," which restricts thinking to a few common employment types, we should coin another term to give ourselves freedom. We should support research to discover groups of workers, within professions and trades alike, who represent characteristic assignments and activities of less than the assumed importance. Once such groups have been identified their duties can be analyzed and organized into new junior college curriculums. Such new training programs will force new pay-roll names; undoubtedly they will increase the number of such jobs and will make more of our people satisfied to seek and to hold them. The suggestions here made for junior colleges would necessitate the employment of some instructors acceptable to the trade organizations and some acceptable to the faculties of higher institutions.

Discussion of all of the strictly professional and technical areas of engineering is here omitted. These are of level and type distinctly different from the areas here under consideration. Certainly, they make a great contribution to our industrial-training program. Probably, a third of their enrollees would be better served through some of the less honored institutions and plans within the province of this article.

Special Schools

The full-time, day, preparatory trade schools have long attracted and accepted many boys and girls who have failed of interest and success in other units of the system. They have, at the same time, served hundreds of thousands of the keenest and most worthy of our young people. The trend is toward higher selection in these schools. Administrators and the employing public are becoming convinced that important trade skills and related technical information cannot be acquired by those gathered largely by a "dumping" technique. Much of the dissatisfaction of industry with the product of such schools has been based upon service of those who attended but were not able to graduate. Poor raw material cannot be consistently changed into a flawless product.

The day preparatory schools may well admit in the first instance, and later admit to specific curriculums, only on proof of stated amounts of general intelligence, mechanical aptitude, and interest in industrial pursuits. Without each and all of these elements in determined requisite amounts in each trainee, the preparatory school cannot do its share in meeting demand and cannot justify its comparatively high per-pupil expenditure. Opportunity for the scientifically selected to attend such schools must be given greater spread. It is unfair and unfruitful to deny initial trade training of a high order to millions of needy and desirous youth because they happen to reside where such schools cannot be located. We should put state money into certain local schools to make them regional. We may well consider state-owned regional schools and state-wide, state-owned institutions where travel and maintenance are provided. Of course we shall continue to make use of the reimbursement aids which have continued to increase since 1917. As to the more recent plans of directly federally aided or federally owned institutions at this level we are faced with a situation calling for great watchfulness. Under cover of defense darkness, an advance is being made that may change our entire outlook in trade preparation and that may push our secondary schools back 20 years from their present broad curriculum status.

Day preparatory school departments may well be of the long-term variety but of uneven length. We should assure these graduates of fundamentals, adaptability to change, and readiness for advance. Perhaps 75 per cent of the learning period in any division of a day preparatory school should be devoted to orientation and breadth in trades rather closely allied, with the remaining one fourth given to intensive preparation toward a pay-roll name and easier placement. These schools should be coeducational wherever possible. There should be more cultural subjects, less production, more cooperative plans, more emphasis upon related content than upon skills.

Perhaps the greatest need for trade and technical education is presented by normally employed adults, by the middle-aged men and women who toil in perplexity and uncertainty and who may be served through evening courses. It need not be argued here that work types wane and die and that new ones are constantly born. It need not be shown that materials and processes change in a way to baffle employers and workmen alike. Constant employment, in these days on the part of a person or of an individual firm, is largely a matter of adjustment. Our evening students must be thought of as needy groups, even more than we do this for other types of schools.

Many adults who are dedicated to nonindustrial pursuits will desire industrial courses of the hobby and recreational kind. Their right to this form of leisure activity, under the guidance and help of our trained personnel, with or without school credit, cannot be questioned. But, we should not permit these persons bent on pleasure to usurp the facilities provided for more needy groups. Let us open our industrial-arts shops to these nonindustrial patrons. If they were to appear in numbers at the doors of our evening vocational schools the men and women for whom these were constructed and equipped would be forced out or would leave of their own free will. There is a difference between attending evening school for fun and attending because to fail to do so means loss of a job or the chance to work.

Some adults need basic training for work fields in industry not yet attempted. Some need retraining because fields or jobs have evaporated or are showing unmistakable signs of decay. Millions need constant upgrading in the trades of their choice in order to remain competent. Still others need marginal preparation so that employers may shift them, as the months pass, the better to meet the peak-and-valley conditions within single firms. As technological advances are made and as cyclical changes occur, our adult workers will continue to face us as needy and hopeful groups. We owe them a constant service, a service assumed to be varied, a service which shows results and fosters their respect for their schools. The continued adjustment of adults is a national problem of major importance; it is a matter for widespread state planning; it is a responsibility of local districts, however small. Every school system must make some contribution through thorough and everlasting study of its own people and its own facilities.

In the evening trade school we would forsake the long-term plan and place our faith in unit courses determined by local surveys. We would seek groups to serve, both of employees and their employers, then match the content and procedure with their needs as we would come to understand them. Evening schools and programs of industrial kind require more attention and money than have been so far expended. They are our greatest bulwark against unemployment, insufficiency, and social unrest.

The Part-Time School

Another important institution is the part-time school or class for employed youth. It has seemed to national leaders as well as to state and local educational authorities that young workers gain through periodic, though brief, contact with schools during the first years of earning. For a few hours each week they troop back from work places for sympathetic help on their problems and for some extended training. Through this service they are improved as individuals. Employers gain quite as surely in being protected from avoidable loss of effort, material waste, and costly turnover. Society as a whole gains most because failures are lessened and many potential public charges are helped to become productive and happy citizens. The part-time school is, in a sense, a deterrent or destroyer of crime, a truly salvaging institution. It affords family and community the opportunity to protect the equities they may have in their young people. We need part-time laws in all the states. These schools are not rendered less useful or necessary by strengthened attendance rules and other regulations affecting minors. Helping a youngster to become adjusted, increasing the strength of his hope and drive, reducing the possibility of his aimless drifting, is necessary at the beginning regardless of when such beginning is made. The part-time school can lay claim to high social usefulness and its economic contribution may not be overlooked. The federal, alphabetical attempts for youth,

now sharply in our minds, might not have come had we placed more faith and effort in our part-time programs.

These day, evening, and part-time schools, in addition to the services of our more general units, may not meet all phases of the need. There will always be a host of young people who cannot succeed in college or beyond and who, just as certainly, cannot meet the standards of full-fledged craftsmanship. These are not to be overlooked or slighted. They are our children. They are going to do much of our work, as youth and adults, and this work will be done well or poorly as we may decree. There is call for testing, trying, and instructing places, with courses of brief duration, where simple jobs and operative skills may be stressed in a wide range of changing fields. We need to dignify more types of work through training, especially those types to be learned quickly and to be supplanted frequently. We need schools where enrollment is necessarily intermittent, to meet the constant and confusing call for first and renewed preparation.

Primary Considerations

In connection with each and all of our school types, to which parts of the full program may be allocated, we must keep in mind certain proved practices and certain innovations. We must base offerings upon vocational education surveys, initial and continuous. We must base content upon occupational analyses to insure functioning instructional items of both the doing and knowing varieties. We must train for tasks in which the whole people engage and place our training facilities where the whole people reside. Small employers must be better served. We must not fail to give earnest consideration to advisory committees, cooperative agreements, itinerant circuits, apprenticeship supervisors, and local co-ordinators. There must be better guidance and follow-up as well as better training because of the shortening work span, with its consequent lengthening afterspan in the life of every workman. We must exalt related and technical information and present constantly increasing amounts of social materials. Above all we must learn to think, administratively, in terms of groups. What can we do for the many subnormal, the host of low average, and the talented few? What for the physically handicapped? What for early leavers, graduates out of work, youngsters free in summer? What for those headed toward college and those not planning to go, for the employed and unemployed adults, for the dull season and the intermittent workers, for the apprentices and foremen? What for the girls and women, to this time so sadly neglected? The task ahead is one of extension and perfection of beginnings. Let us study our people, young and old, in school and out, seeking to learn and to match their needs. There is no individual who cannot profit by the general form of industrial instruction. There are innumerable individuals and groups who cannot enter industry nor "carry on" effectively without specific trade and technical education. The problem varies among communities and our professional obligations extend only to the planning of the best possible programs under the conditions faced.

Responsibility and Control

It may be well, also, to suggest a better division of training responsibility among public, endowed, corporation, and private or profit schools. Certainly these four are sadly overlapping to the discredit of the movement and to the increased cost of the full program. Their provinces are not individual and distinct but there could be more of cooperative planning to weed out duplication and to prevent one agency from embarrassing the work of another. It is fair, in view of present competition, to ask who should provide or control vocational education in any and all of its types.

Trade and technical education must be brought nearer to the homes of more young people and of more employed adults. It must be brought nearer to more employers, large and small, and must involve more types of occupations. Both boys and girls, both women and men, must be privileged to profit by this work. There must be preparation, upgrading, retraining, marginal help, and constant readjustment.

This is an extensive program, not wholly new but rapidly expanding. It will require much money and much constructive organization.

Fundamentally, vocational education is a public responsibility but the public will need help from all reasonable and worthy sources. Many agencies with varying clienteles and facilities must be accorded a share in this work.

There cannot be too many *special schools* if their purposes are well conceived and their provinces well co-ordinated. There cannot be too many *vocational courses* in the general schools if they are real as to content, method, and instructor. There cannot be too many *endowed schools* if they will link their services with others about them and add their resources to the common reservoir. There cannot be too many *private or profit schools* if they will stop at a fair return on the investment and meet our public standards. There cannot be too many *corporation schools* if they will use such cooperative means as are available.

We should put more *public* money into *public vocational schools*, local, regional, and state. We should put some *public* money into *endowed schools* if the combined services were to be fairly integrated. We should put some *public* money into *private schools* if they will agree to carry a designated part of the load with real service as the aim. We should put some *public* money into *parochial schools* if they will accept greater participation in the training work in which we are engaged. We should put some *public* money into *corporation schools* if they will open their doors to workmen from the smaller and less favored firms. In other words, public funds should be offered, in varying amounts and for specific functions, to any agency whatsoever, that will adopt our public attitude toward the problem.

Earlier we raised the question — Who should provide or control vocational education? As far as trade and technical education is concerned the answer is that many should give it and that not one should sell it for profit. The people need it and democracy is conditioned by it. Let public supervision be fair but let it be firm as well. What the people want, what the people can't well get along without, let the people provide for themselves, either directly or through specific assignments and subsidy.

Let us assume that the public shall initiate giving the service its chief drive and its true direction. Let us think of it also as a cooperative endeavor and give full encouragement to all agencies that will participate in the public interest. On the other hand, let us be as ruthless as we know how in crushing out those agencies that persist under some other motive. If we believe in trade and technical education as a personal and social and economic necessity, the issue seems clear as to who should sponsor and direct it. Vocational education, in all of its types, is a public trust. Let those who believe this divide the load happily among them. Let those who believe otherwise be denied any part in the training of our people. Let no one prey upon our people or fool our people in the name of vocational education. The term *public* as here used means local and state authorities insofar as promotion, direction, and supervision are concerned. The Federal Government can render most aid through studies and reports of national scope and by increasing the available moneys to be routed through long-established channels.

Education is free and comes to each one
Whenever you wish it — for work or for fun;
The kind that we teach is not very new
It came to Cleveland for me and for you;
In fact, fifty years have come and gone
And industrial arts still marches on.

I am glad to be taking part on this day
In helping to celebrate, as we Americans say,
A milestone of progress in training our boys
To be happy and satisfied with all of the joys
That come to people who are able to say,
"I am proud to be living the American way."

— *Frank C. Moore,* Director of Industrial Arts, Cleveland Public Schools

Santa Barbara's New Industrial Division

EMANUEL E. ERICSON*

On February 6, 1941, at 7:45 in the evening a unique radio program was presented over the Blue Network of the N.B.C. "You are listening," said the announcer, "to the dedication ceremonies of the new industrial-division plant of the Santa Barbara State College located at the shore of the Pacific Ocean, overlooking the city, and our colorful range of mountains."

The announcer and the various speakers then pointed out that this group of buildings is the first development of a new campus of the State College, the mother institution now being located across the city about three and one half miles distant.

Dr. Walter F. Dexter, State Superintendent of Public Instruction, who was the principal speaker of the evening, paid tribute to the work in industrial education for which Santa Barbara State College has become known, and indicated some of the reasons why this division should have been the first to be given this one-half million dollar plant on the new campus. The following excerpt from his radio speech reveals his clear insight into modern education needs:

"This is an occasion that will long be remembered, not because of what we say here at this moment but because it gives recognition to the fulfillment of a vision and the achievement of an ideal. The achievement which we celebrate . . . is typical and indicative of the work to be done here. In these buildings energetic and industrious students will acquire vocational skills. They will work with resourceful and intelligent instructors who will teach them to outline, organize, and complete physical and mechanical projects.

"In this environment of shared experiences they will gather and classify elementary facts. They will acquire and systematize useful knowledge. They will formulate and defend ideals that give purpose and balance to our American way of life. In short, in the classroom, library, and laboratories of this plant, the student will not only learn how to make a living but also how to build a life.

"We want a system of education that gives judgment a chance. We want a system of education that gives initiative an opportunity to find expression in free individual enterprise on the one hand and in cooperative group action on the other. We want a system of education that permits and encourages the development of intellectual and spiritual values through the normal pursuits of the workaday world.

"In order to provide a program of this kind or even permit it, to say nothing of promoting it, we must recognize a simple and yet profound truth. Without equivocation we must accept the thesis that bodily skill is as important a component of culture as is knowledge; we cannot, we dare not longer overlook this salient fact."

Santa Barbara State College was established more than 30 years ago by the state of California as a training school for teachers in "Manual Arts and Home Economics." Ednah Rich Morse, who is now President Emeritus and who was one of the speakers on the radio program referred to, was its original founder and president for six years.

While other major phases of work have been incorporated into the curriculums of the college from time to time during the past 20 years, under the administration of Clarence C. Phelps who became president in 1919, the program now offered under the comprehensive term "Industrial Division" has increased steadily in variety of offerings, in members enrolled, and in favor of those who have employed its graduates.

For several years it has been recognized that this phase of the college had outgrown its physical facilities and that it would not long be possible to admit a large enough

Front view of main industrial building which has a floor area of 62,000 sq. ft.

The new Industrial Division of the Santa Barbara State College

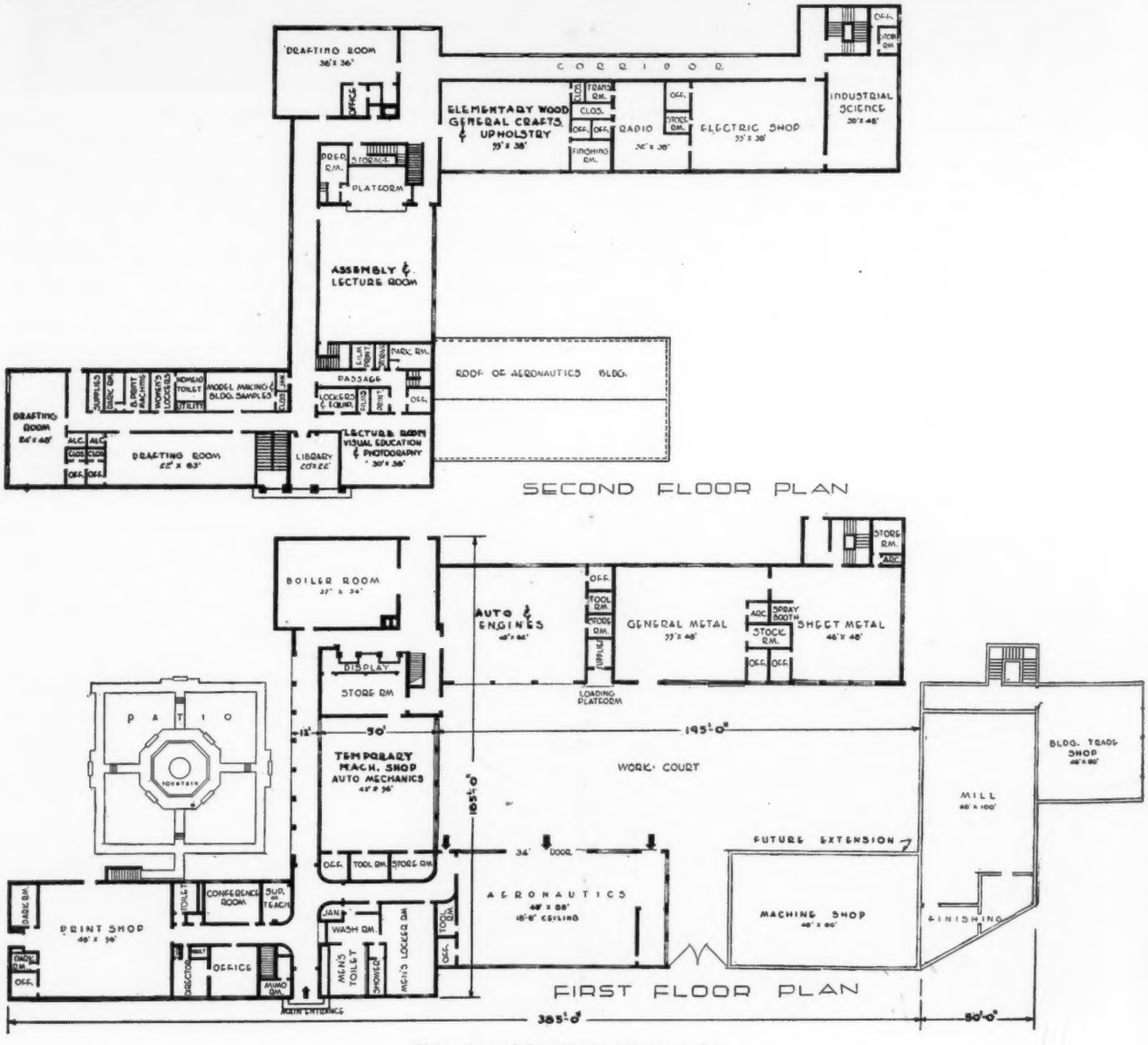
*Professor of Industrial Education and Director of the Industrial Division, Santa Barbara State College, Santa Barbara, Calif.

number of students to respond to available employment opportunities without launching a major reorganization program in regard to housing and equipment.

This new industrial-division plant completed so far, consists of one main industries building comprising 62,000 sq. ft. of floor space, and a group of four smaller buildings with a combined floor area of 8000 sq. ft. devoted to architectural landscaping and horticultural work. About 8000 sq. ft. of floor space is still occupied in the old plant, awaiting the additional wing as shown in the drawing.

Distributed over this large area under 18 industrial-division faculty members, are more than 110 different course offerings, with others to be added later. A brief grouping of these offerings may be of interest. Reference to accompanying floor plans will indicate amounts of floor space devoted to each.

Industrial division of the Santa Barbara State College



Floor plans of the industrial division of the Santa Barbara State College

One of the three drafting rooms in the main industries building of the new industrial division of the Santa Barbara State College

The following courses are offered in three drafting rooms: freehand drawing and industrial design, aeronautical drafting and design, machine drafting and machine design, home planning and architectural drawing, and drawing related to electrical, radio, and other technical work.

The aeronautics program which has been given much floor space and equipment involves airplane mechanics, airplane engines, aerodynamics, meteorology, navigation, various other ground-school subjects, and actual flying. All of this instruction is given in cooperation with the United States government. Design and construction of regular aircraft is a part of this program.

Automotive work covers engine mechanics, motor tune up, body and fender work and general repair. An electric chassis dynamometer is a part of the equipment for this work.

In the field of metalwork which has been so sharply brought to our attention lately because of the acute shortage of workers, there are offerings in patternmaking and foundry practice, electric and oxy-acetylene welding, machine-shop practice, tool and instrument making, heat treating and basic metal laboratory work, sheet-metal fabrication, art-metal work, and other allied activities.

The field of electricity, radio and sound, involves selection, installation and care of electrical equipment, manufacturing of electrical and radio equipment, radio service, code practice and transmission. For this work two rooms are provided with a separate radio station. A complete public address system reaching 22 different rooms and laboratories and 22 offices has been completed and installed by the classes in radio and sound.

In printing there are offerings in hand and machine composition, presswork, color printing, newspaper work, bookbinding, typographical design, and offset printing.

Wood construction and design is represented by courses in millwork, building construction, boat design and construction, carving, upholstery, and furniture making.

The work in visual education, for which a number of small workrooms have been provided, will give training in selection and use of projection equipment for schools and homes, photography, and audio-visual education for schools.

The industrial science laboratory offers courses in applied mechanics, testing of materials, principles of air conditioning, applied science, and research.

The assembly room has a complete small stage in connection with which stage craft, stage lighting, and sound transmission can be carried out.

The architectural landscaping program involves garden design, horticulture, floriculture, and landscape gardening. These courses lead to a regular college degree or a certificate of competency at the termination of a shorter period.

While the majority of students in this division are still engaged in teacher training in industrial arts, technical degree programs are now offered leading to positions as technicians, sales and servicemen, laboratory workers, managerial positions, and high-grade precision workers for the industries.

Corner of elementary woodwork and craft shop of the new industrial division at the Santa Barbara State College

"Self-reliance can turn a salesman into a merchant; a politician into a statesman; an attorney into a jurist; an unknown youth into a great leader. All are to be tomorrow's big leaders — those who in solitude sit above the clang and dust of time, with the world's secret trembling on their lips."

— *Hillis*

Thank God every morning when you get up that you have something to do that day, whether you like it or not. Being forced to work and forced to do your best will breed in you a hundred virtues which the idle never know.

— *Charles Kingsley*

Memory Molds

DEAN M. SCHWEICKHARD*

The Perpetuating Process

A vivid story of vegetable life upon the earth even antedating the probable appearance of the human race may be found in the delicate imprint of leaves and plants in coal formations. Likewise the footprints of prehistoric animals now extinct, imprinted centuries ago in the mud and later turned to stone, have left a lasting record to be unmistakably interpreted by various tribes and races of men.

It may have been observations of this sort which led to the widespread practice in art and industry of reproducing desired forms by means of molds made from the original. A large part of the printing industry is dependent upon the use of molds in metal and papier-mâché; decorative plaster moldings and designs are made possible through the use of glue molds; and ice cream for all sorts of special occasions is given appropriately significant forms by the use of molds prepared in anticipation of the need.

The limits of the fields which can be touched by means of this process are practically boundless, and no detail is too fine, nor mass too great to be successfully handled if the right materials and techniques are used. In the metal foundry the pattern is usually of wood, and the mold, which is made in sand, is carefully prepared to eliminate all defects before the molten metal is poured into it. The mural treatments which appear in relief upon the massive walls of public buildings and stadiums are produced through the utilization of clay, plaster, concrete, and other mixtures which can be handled in the pliable or semiliquid state later to solidify into permanent form.

Through long experience it has been proved over and over again that the quality of the final product is dependent upon the degree of perfection in the original pattern and in the mold which is made from it. With that fact emphatically and unalterably established the way is opened for an enormous development in the utilization of all sorts of plastics for an unlimited variety of uses.

Coming to Life

The sculptor or other molder of material things would be astonished if the product of his skill were suddenly to spring into life and begin moving about of its own volition. Still everyone is engaged constantly in the process of making molds through memory which are to shape all of his acts and states of mind for the rest of his life. These molds if well made and wisely used serve to increase one's personal usefulness and effectiveness in the world and strengthen his contribution to the improvement of his relationships with others.

Every clear and distinct mold retained in memory aids in subsequent learning. It is only by this means that learning advances in any field whether it be science, mathematics, literature, economics, tennis, archery, machine-shop practice, or cosmetology. If one pauses too long in the admiration of one perfect mold in his memory, however, his progress is retarded, and he becomes hopelessly involved in an unwise repetition of thoughts and acts. He is like the defective phonograph record which causes the needle to travel round and round in the same groove without moving ahead.

The molds made by memory are considered to be such a vital element in the development of the mind that they are utilized as a basis for measuring degrees of general intelligence. They are highly important factors in shaping our impressions of others and their impressions of us. Particularly significant in this connection is the fact that one favorable mold added to another continues to strengthen the impression. This holds true whether the molds are made one after another in chronological order, or come simultaneously from different sources, as in the case of recommendations upon an applicant for a position.

It is the molds indelibly impressed upon our memory that make us homesick when we leave the places and the people we have become attached to and go into strange environments. Likewise it is this same sort of mold which helps us to become adjusted to the new situations and to control our conduct in the light of past experience and observation.

Even animals give evidence of retaining some sort of molds derived from kind or harsh treatment, and various other forms of association and experience. The faithful dog exhibits very obvious signs of genuine delight at reunion with his master from whom he has been separated for months or even years. It is said that the elephant never forgets, and the horse who has gained the freedom of the pasture often refuses to come and try the tempting ear of corn or handful of oats because he has somehow retained an impression of having been previously lured into being caught by the same means. The rabbit shuns the alluring morsel of food placed in a trap because of disastrous or painful experiences in the past, whereas the same kind of food would be eaten without hesitation if discovered in an environment which called forth a different association.

The value of the molds that memory makes is not appreciated to the full until they are partially or entirely obliterated. There is the tragedy of one who loses his memory through injury and is unable to remember even his own name. Every student in school has had the distressing experience of failing to remember the essential facts in an examination; and the football player occasionally misses the signals because fatigue, excitement, embarrassment, or confusion has temporarily obliterated their pattern from his memory.

In the press of duties other obligations and intended courtesies are sometimes overlooked due to vagueness or absence of the necessary memory pattern. Affairs of the moment are often the cause of forgetting some important event such as the birthday of some member of the family. At this time of year one is particularly anxious that his memory shall play him no tricks in the acts of thoughtfulness and kindness he wishes to perform.

The Master Mold

It is well we should have a special season each year devoted particularly to those deeper and finer aspects of life which memory has taught us to cherish and revere. At any time of year there are some unpleasant molds as well as pleasant ones which memory has implanted within us. The unpleasant molds, however, may serve to make us kinder and more considerate toward other people in order that they may avoid the things which were disagreeable to us. Christmas time is an especially appropriate time to pick out the molds which have been made in our memory through times of joy and happiness, and make them produce new joys for others.

Christmas brings many memories and each passing Christmas should serve to enrich the store. There are memories of happy times other people have brought to us, and of happiness we have found in doing kind things for others. Some of the most vivid thrills have come through our secret discovery and fulfillment of the needs, wishes, and hopes of our closest friends and relatives. Memories linger of some of our innocent childhood beliefs which have molded our later lives, and might still do so if we would let them.

To some, memories bring nothing but sadness because of the things which once were and now are no more. Such a one is only shuffling over the empty molds and not using them to produce new and living forms. At a time when the affairs of the world seem ominous there is all the more need for bringing forth the patterns from which we may remold joy and hope and utilize them in unlimited quantity production.

It is rather significant that the idea or

(Continued on page 434)

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

John J. Metz, Editor

The 1941 A.V.A. Convention

The American Vocational Association convention to be held on December 10 to 13 at Boston has made training for national defense the main topic of consideration especially for the various vocational groups. Boston itself will be able to show visitors, trade schools conducted on 24-hour schedules in order that the defense training would not interfere with their regular vocational-education classes.

The National Association of Directors of Vocational Education which will hold its annual meeting on December 8 and 9, just prior to the regular convention of the American Vocational Association, will also center its discussions about the vital question of training for defense. Even such divisions as industrial arts, distributive education, rehabilitation, and home economics will discuss methods whereby they, too, may cooperate in doing the work of the hour when the welfare of our country demands that everyone shall do his part to preserve our democratic form of government.

This year's annual convention requires the attendance of as many as possible, so that out of the deliberations held, will evolve the best plans for the future of that phase of education which is particularly entrusted with the training of those who must furnish the brains, skill, and brawn required in American industry and commerce.

The administrators, directors, supervisors, and instructors who have charge of industrial arts and vocational education are, of course, interested in the success of this convention, but they must remember that passive interest is not enough. It is only when they or their duly elected representatives attend at Boston and enter into the discussions, that the full success of the 1941 convention can be secured.

The Volume Just Finished

When this number of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION reaches the reader, Volume 30 will be completed. Having finished another major portion of the magazine, it is just natural that one wants to look back over the past year to see what has been accomplished. A scrutiny of the index, in this issue, will help in making this survey.

It is encouraging to see that a large number of the readers have taken an active interest in working toward the advancement of their profession. A count will show that during the past year 212 authors have done their part to help perfect the picture of what those engaged in industrial arts and vocational education have done, so that future generations can view what has been accomplished so far, and make use of this knowledge to make further progress and improvement.

In keeping with the trend of the times, defense training has been emphasized. There were 16 articles on this subject.

Course outlines, too, have received worth-while recognition and are represented by nine articles. Attention should also be called to the analyses that have appeared during the past year.

The auto-mechanics articles, while not numerous, nevertheless represent real worth. The other shop activities like drafting, electricity, general shop, machine shop, metalwork, printing, and woodworking all are sizable contributions.

Tests and testing are represented by 26 articles, shop planning by 16, and guidance by 4.

It may also be well to study the list of authors. There will be found leaders from the fields of both industrial arts and vocational education, the supervisor of the large and the small community, and the teacher from the metropolis and from the agricultural sections of our country, all imbued with the idea of improving themselves, aiding their fellow workers, and improving their profession.

Preference Rating Order No. P-22

The amended preference Rating Order No. P-22, as far as its use applies to vocational training, covers the acquisition of material for maintenance and repair of the property and equipment, and placing it on an adequate operating basis without expansion or further improvement unless authorized.

To get the full import of this amended order, those who have the responsibility to keep vocational training up to its highest level of efficiency in these days of national emergency, should get in touch with their local or nearest representative of the Office of Production Management or write directly to the Office of Production Management, Washington, D. C., and ask for a copy of the amended Preference Rating Order No. P-22, because to apply Rating A-10 to any material required under this order, the original and all copies of the purchase order or contract must bear the following endorsement: "Material for Maintenance, Repair, or Operating Supplies — Rating A-10 under Preference Rating Order P-22, as amended, with the terms of which I am familiar."

This endorsement will then constitute a certification to the Office of Production Management that such material is required for the purposes stated and that the application of the rating is authorized by order P-22.

For new and additional equipment and materials required for schools doing defense training, other preference ratings can and must be obtained, as Order No. P-22 does not apply to these situations.

American Ingenuity Wins Another Victory

The Glenn L. Martin Co. recently produced a bomber plane which can dive at the terrific speed of 560 miles per hour. This means that it travels at a speed of 821 ft. per second.

When one considers that sound travels through the air at 1130 ft. per second, at 68 deg. F. in still air, it is easier to realize the tremendous speed at which this monster of death hurtles through space on its mission of destruction. That airplane travels almost three fourths as fast as sound.

Looking at the bomber merely as a piece of mechanism, every school-shop teacher, whether in the field of industrial arts or in vocational education, may justifiably feel that he had some part in the production of this efficient piece of machinery. It is in the school shop that the future workers of America get their first introduction to the skills, knowledge, understanding, and appreciation which mechanics must have to produce machines like this new bomber, in which accuracy and the smooth co-ordination of parts must be practically perfect. School-shop teachers should not overlook their part in the general scheme of educating Americans, and they should not be backward about claiming their part of the credit in the things that are achieved.

Adjustment Through the Arts

C. H. WALLER*

The past decade in American education has witnessed more discussion and revision in curriculum than any preceding period. Philosophies of education acceptable some few years back have been challenged by social and economic forces more potent than in any previous period. Educators individually and collectively, philosophers, politicians, economists, sociologists, and laymen are competing for leading roles in the educational drama. Of what should education in a democracy be composed? What are the needs of the individual and society in American democracy? What is the responsibility of the school in the current social order? These and many others are current catch questions familiar to all those engaged in education from the kindergarten through the college.

A score of educational commissions have been concerned with the answers to questions like these just suggested. Several states and a great many cities and separate schools scattered across the country are struggling with these problems. Some schools have revised programs and others have completely discarded plans which were considered workable only a few years ago in an effort to make their educational offerings meet the demands exacted by present-day society.

In short, the school today — meaning the whole gamut of education — is concerned with problems undreamed of a few short years ago. To be utterly facetious about a really painful situation, the school finds itself — however reluctantly — the foster parent of a multitude of children whose names, when called, send shivers up the spines of many otherwise brave educators. Consider a few of them: youth problem, unemployment, change, social needs, mobility, integration, core, essentialism, functionalism. Many more can be added, and one can easily see that the parent of these "bewildering offsprings" were — and are — social confusion and sheer necessity.

The place of the arts in the school and as an area for the personal development of the pupil — adjustment through the arts — is no less confused. Hence a discussion of some of the aspects of this problem might well give rise to fruitful conjecture as well as qualms. It is hoped, moreover, that the technique to be discussed as an inventory aid in the analysis of personal characteristics will further illuminate the claims made for the arts as an active ingredient in the curriculum.

This discussion, then, touches upon three main points, all of which lead to the techniques just mentioned: first, a general summary of needs on which, apparently, there is some agreement; then, remediation or the technique which may be used in the solution of this adjustment problem; and finally a few implications of the problem.

Needs, in the sense the word is used here, come under two headings: personal and social, or in other words, the place and rights of the individual in school and society and the legitimate demands of school and society on the individual.

As a minor premise it is safe to assume that the school shop, while perhaps still in the basement, has become a part of the school and that the shop teacher has shed his shop-coat attitude and has joined the rest of the faculty in the clear-eyed examination of this adjustment problem. The departments of a school are no longer single entities; the whole school functions as a unit in the educational process.

Hence, in the discussion of these personal and social needs it can be assumed that we meet on common ground. On the one hand, society, of which we are all a part, exacts certain things from us in payment for belonging to a group. And on the other hand, we as individuals, demand certain privileges in the minor sphere of personal action — action not affecting the group as a whole. The balance sheet looks something like this:

Social living requires: (1) cooperation, (2) tolerance, (3) good manners, (4) social responsibility, (5) economic responsibility, and (6) political responsibility, to lump these needs under fairly large heads.

The individual demands: (1) the right to earn a living, (2) reasonable security, (3) personal satisfaction, (4) the right to home and family, and (5) the pursuit of happiness.

These conditions are not proposed as all-inclusive, nor have they been set up as mutually antagonistic. The whole problem of adjustment seems to be a fine balance between the demands of society and the rights of man. They cannot be separated. You cannot talk about one without talking about the other, and adjustment is the crux of the situation, the squaring of the issue, as it were.

Now, passing from the comparatively safe and simple assumption that we agree on the needs of the individual and society, we can approach some of the tangible aspects of the otherwise intangible problem of adjustment.

We have a pretty clear idea of the conditions imposed upon us as individuals in society; we realize what it means to live in this particular society. Now the question is: what can we do as teachers to foster these highly desirable attitudes and social traits in the growing child? And, more particularly, where do the arts fit in this large outline that has been sketched?

Once upon a time there was a decade in American history called "the Roaring Twenties" in which manual training had already given way to something called manual arts; then came a period known as the "Thirsty Thirties" which witnessed an increasing emphasis on the arts aspect of the subject; and now embarking on our own time, which might well be known as the "Furtive Forties," the term industrial arts has come to mean something entirely different from the old manual training — in fact the next title of the course, from all indications, will be the social industrial arts.

Today, the arts — industrial arts, fine arts, home arts — depending on which perspective of the area you hold — occupy a significant position in the education of the adolescent. Hence our particular concern with the problem. In the school shop — in the industrial laboratory, to use a word that is probably closer to the situation — the teacher of the arts is in a very advantageous position to observe the child under more natural conditions, and he is thus better equipped, if he is aware of what is going on, to bring about a more satisfactory adjustment of the individual both to school and to society. Why? Prove the truth of this statement in the light of your own experience. The teacher of the arts gets the student out of the classroom atmosphere in a place where they can be themselves, where they discover again their hands and their bodies, where they find themselves let loose in a creative air where they may pursue their naturally creative instincts.

It follows naturally, then, that these social attitudes, traits, or patterns can and should be searched for and promoted in the arts. Now the question is, what are the marks of these desirable attributes, how can they be visibly discerned, and what should be done about them in the arts.

Certainly, when we speak of an individual's adjustment — or lack of adjustment — to the group of which he is a part we include such vital factors as: good manners, cooperation, tolerance, initiative, breadth of interest, independence, and interdependence.

Only recently have attempts been made to assess the much talked-about "intangibles" of educational needs — the personality characteristics of the individual. Much difference of opinion exists as to just what personality is, although all agree that desirable qualities are very important and even imperative to successful living.

The recent 12-year study of the Committee of the National Society for the Study of Education[1] has been one of sev-

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[1]A. H. Edgerton, University of Wisconsin, Chairman. Unpublished Ms.: "Relative Acceptability of Educational, Vocational, Personal-Social Adjustment Qualifications."

eral studies made to determine the type of qualifications desirable for present-day living. It concludes definitely that cooperation, initiative, courtesy, creativeness, persistence, temper, and leadership are qualities much sought for by some 338 representative employers.

Assuming the importance of personality and the existence of individual patterns, and recognizing that these attitudes may be developed, the following technique is suggested as a means by which educators may observe these much talked-about qualities in growing boys and girls. It is, in the writer's opinion, highly important that we develop ways for observing these characteristics before we employ methods designed to instill them in the individual.

It is recognized, of course, that several methods for measuring personality characteristics have been developed. One excellent means is the observation of the overt behavior of the pupil in various situations. Another is the compilation of opinions of people who have associated with the pupil. Probably the first method is preferable, but it is also the costlier of the two in terms of time and energy. It goes without saying that a combination of all known methods is most desirable.

The particular method or technique which the writer is suggesting as an initial means of studying personal characteristics is a paper and pencil instrument. It is through the use of a questionnaire or interest inventory that this approach to the continuous problem of adjustment is presented.

The construction of this questionnaire is based on the premise that individuals will usually react honestly to situations which confront them — sometimes admittedly a fallacy — and further that through the examination of a pattern of response, consistent or inconsistent, it is possible to secure at least some fragmentary ideas on the personality make-up of the individual who reacts to the questions.

Preliminary to the construction of the items in the inventory a group of personal qualities deemed desirable was singled out. Among them were included cooperation, leadership, perseverance or stick-to-itiveness, industry, initiative, and inquiring mind. In addition to these qualities an attempt was made to set up certain situations which would describe attitudes toward certain different kinds of activity the pupil preferred to engage in, such as manipulative work, oral discourse, business and social activities, and precise painstaking work.

With these in mind, then, about 150 statements were written which, it was thought, might reveal when reacted to, the individual's feelings or characteristics in terms of his likes, indifferences, and dislikes. These original items were given to some 140 high school boys and girls and their responses compared with the opinions of teachers who had worked with these students. This means of validation ultimately gave the writer the present group of statements. Reliability was checked by administering the items at three intervals of approximately six weeks. Significant consistency was noted in patterns of the individuals as they responded to the same questionnaire at the stated intervals. The Interest Questionnaire for Industrial Arts follows:

Interest Questionnaire for Industrial Arts

Directions: Read each statement below. To the left of each statement are the letters L I D. Draw a circle around that L (like) if you like, or want to do what that statement says. Draw a circle around the I (indifferent) if you neither like or dislike it. Draw a circle around the D (dislike) if you dislike it or would not enjoy doing it. Try to check every item by encircling the letter which most nearly expresses your honest feeling.

L I D 1. To visit plants and industries.
L I D 2. To hear men working in these plants explain their work and problems.
L I D 3. To watch someone repairing a car.
L I D 4. To repair a broken piece of furniture (a chair from home).
L I D 5. To refinish a piece of furniture.
L I D 6. To develop a high degree of skill for doing a job rather than to do several jobs not requiring so much skill.
L I D 7. To see movies on the manufacturing of various industrial products.
L I D 8. To work with one or more classmates in building a project.
L I D 9. To discuss trips or excursions you have taken to a manufacturing plant.
L I D 10. To find out what things are manufactured in your city.
L I D 11. To watch a big building as it is being constructed.
L I D 12. To analyze the community on the basis of visits to business and industrial establishments.
L I D 13. To find out such things about occupations which you might enter as: training needs, salary, probable future, advantages and disadvantages, etc.
L I D 14. To organize a group of individuals all interested in some hobby.
L I D 15. To be a member of a hobby craft club.
L I D 16. To make the plans for something you want to build.
L I D 17. To find out how different kinds of motors run — Diesel, electric, gasoline, etc.
L I D 18. To build little "gadgets" and see if they work, like making a mechanical arrangement for turning on the heat, the light, shutting the windows, etc., all run from an old alarm clock.
L I D 19. To have the instructor lecture for about 15 minutes daily about things pertaining to the course.
L I D 20. To run power machines: jig saw, planer, printing press, lathe, etc.
L I D 21. To work on two or three different projects at the same time.
L I D 22. To have the "foremanship" system in the shop.
L I D 23. To learn the names and uses for all the tools in the shop.
L I D 24. To give an oral report to the class on some topic.
L I D 25. To help check up on the care of tools, materials, etc.
L I D 26. To study the theory of electricity or heat treatment of steel.
L I D 27. To do "odd" jobs around the shop or at home.
L I D 28. To clean the finishing room, the shop, or machines.
L I D 29. To use your own tools rather than borrow from neighbors.
L I D 30. To help your classmate solve a problem which has confronted him in the making of a project.
L I D 31. To decide for yourself just how good or bad something you have made really is.
L I D 32. To tell your classmate what is wrong with his job.
L I D 33. To hear or read about a project rather than to build it.
L I D 34. To get help from the teacher rather than from a classmate.
L I D 35. To have your classmate tell you what is wrong with your job.
L I D 36. To tackle doing a job which you know you are going to have trouble in completing.
L I D 37. To make a project which didn't turn out well over again rather than do some other project.
L I D 38. To run a machine correctly which if used incorrectly is very dangerous.
L I D 39. To read advertisements about autos, airplanes, ships, machines, etc.
L I D 40. To have your classmates ask you how to do an operation on a project.
L I D 41. To be shop foreman.
L I D 42. To watch your classmate while he is making a project.
L I D 43. To buy the stock for a project cut to specified required sizes needed.
L I D 44. To pick out your own wood rather than have the man at the lumberyard select it for you.
L I D 45. To do a job which requires a great deal of carefulness and precise work.
L I D 46. To sharpen your tools.
L I D 47. To start or turn on the power on a machine.
L I D 48. To hear about the life of some man like Rudolph Diesel or Thomas Edison.
L I D 49. To find out where the machines made in a plant like the Gisholt plant are shipped and what they are used for.
L I D 50. To be able to come into the school shop after school hours or have a workshop at home, where you can work on things.
L I D 51. To be an officer of a hobby craft club, a yacht club, etc.
L I D 52. To be in a shop where the instructor allows the class much freedom.

L I D 53. To have the teacher use your job as an illustration of how a project should be done.
L I D 54. To have your job be the best one in the class.
L I D 55. To stop working on a project that isn't turning out well.
L I D 56. To get one project done before starting on another one.
L I D 57. To have a classmate help you in working out a problem.
L I D 58. To be the first one in the class to finish a project on which the whole class is working.
L I D 59. To have the teacher use your project to demonstrate on, or work on in showing the class how an operation is done.
L I D 60. To have your project graded by comparing it with the other projects made in the class.
L I D 61. To work out new ways of doing an operation on a project.
L I D 62. To make a project like some other classmate has made or is working on.
L I D 63. To make several little projects rather than one or two larger ones.
L I D 64. To be chairman of a committee to plan a group report for the class.
L I D 65. To design and make a tool or device for doing an operation for which there is no suitable tool with which to do it.
L I D 66. To make something to use rather than to buy it.
L I D 67. To talk over with your parents the things you are doing in school.
L I D 68. To put the various parts of a thing together.
L I D 69. To have the teacher point out what is good or bad about your project.

Probably the best way to describe the use of the questionnaire is to describe an actual case pattern along with the interpretation given for this particular case.

The case considered is that of a ninth-grade boy who responded to the questionnaire the second day of the opening semester of the school year. There was no information about this boy when the questionnaire was given and the interpretation written. Close observation and study, and the opinions of other teachers, indicated that many of the individual's characteristics revealed in the interpretation were typical of the case. The detailed case study follows:

Analysis Sheet

Industrial-Arts Interest Questionnaire

Name — Case 21 Age 14 I.Q. 128
Class — 9th I. A. in 7th Grade

Likes: 1, 3, 7, 11, 20, 21, 31, 33, 38, 40, 41, 42, 43, 47, 48, 51, 52, 53, 54, 55, 58, 59, 63

Indifferences: 2, 4, 5, 10, 13, 15, 17, 19, 25, 27, 29, 32, 34, 39, 46, 49, 56, 62, 68, 70

Dislikes: 6, 8, 9, 12, 14, 16, 18, 22, 23, 24, 26, 28, 30, 35, 36, 37, 44, 45, 50, 57, 60, 64, 65, 66, 67, 69.

Analysis: This boy states likes on 23 items in the inventory:

1. Visiting plants and industries.
3. Watching someone repairing a car.
7. Seeing movies on manufacturing various industrial products.
11. Watching a building being constructed.
20. To run power machines.
21. To work on two or three different projects at the same time.
31. To decide for himself merits of something he has made.
33. To learn or read about a project rather than to build it.
38. To run a machine correctly which if used incorrectly is dangerous.
40. To have a classmate ask him how to do something.
41. To be shop foreman.
42. To watch a classmate make a project.
43. To buy the stock for a project which is cut to specified sizes required.
47. To start or turn on the power on a machine.
48. To hear about the life of inventors.
51. To be an officer of a club.
52. To enjoy much freedom in the classroom.
53. To have teacher use his job as an illustration of how things should be done.
54. To have his job be the best one in the class.
55. To stop working on a project that isn't turning out well.
58. To be first in class to finish group project.
59. To have his project used for demonstration in building.
63. To make several little projects rather than one or two larger ones.

There is evidence that this boy prefers to see, and to some degree, hear about things to actual "doing"; that he has an excess of confidence in himself, possibly to the extent of being egotistical; he indicates a desire to be superior to all in his group, to be looked upon as a leader; he wishes to show others "how it's done" but does not seem to have much resourceful effort or initiative; his home adjustment may be undesirable, he may not be acceptable socially to the class group; he appears to be an individualist quite definitely. He is very consistent in this pattern.

His indifferences are numerous and not altogether consistent; leaning toward the "dislike" side of indulging in manipulative work or problem solving, that is, he is indifferent to the feeling that this action would require too much effort on his part. He indicates quite clearly that he is not interested in cooperating with individuals or groups for a common end, although he wishes to lead the others. Apparently he doesn't see too much need for the instructor or the rest of the class. He would just as soon use his neighbor's tools as his own and isn't concerned about caring for his equipment. His dislikes are very consistent when viewed with his likes.

From the 26 "dislikes" checked, one receives the following impressions. These trends appear to substantiate his "likes" pattern to a high degree and they augment the impressions derived from the "indifference" responses.

He dislikes to develop a high degree of skill, but prefers "dabbling" in several jobs; dislikes working with a classmate on a job as well as being a member of a club. He dislikes to plan a job ahead, dislikes all items involving study of principles, prefers line of least mental and manipulative resistance, doesn't want to tackle anything difficult or do over a job once poorly done. It is interesting to note that he dislikes the foremanship system although he would like to be foreman — nonsocial, noncooperative. Apparently he has not been accepted by his group. He indicates again his preference for the easy way when he states that he dislikes to start with materials in the raw; he prefers to buy the pieces ready to assemble. He is consistent in disliking help from any source, although he likes to tell another how to do something. He would rather buy a project than construct it and dislikes to have the instructor grade his project or tell him what is wrong. He dislikes to confer with his parents regarding his schoolwork. This boy undoubtedly needs help in order to adjust his personality satisfactorily.

It should be remembered, of course, that interpretations like the one just given, are, at best, subjective to a high degree. They are merely indicative of certain individual characteristics, and they should be used with great reservation and augmented with all kinds of information which can be secured about the student. An interest questionnaire of this type designed to reveal personality characteristics may best be used as a projective device — that is, the results are indirectly rather than directly indicative, and the interpretation is made on the basis of what lies behind the responses of the subject. The pattern of the subject's responses reveal unique features regarding the subject's basic drives with environmental forces. In still other words, the interest questionnaire "offers the individual the opportunity to reveal his way of organizing experience by presenting him with a large number of activities and situations from different areas to which he reacts emotionally in terms of *like, dislike, indifferent.*[2]

It is entirely probable that for some time to come it will be necesasry to search for the personal and social needs of the individual through indirect and projective procedures. At least until better ways are devised, indirect and subjective methods must be employed. The important fact remains, however, that the technique used is not as important as the recognition of the need for observation and study of personality, and its adjustment to the kind of life in which it exerts itself.

Industrial arts offers a real opportunity for observation and study through its informal organization, and it can contribute in a large measure to the development of revealed needs. Certainly the paramount implication is — by reason at least of the changing aspect of the subject and the increasing emphasis on the social nature of the arts and education in general — the discovery of the individual as such: what his attitudes are, his slant on life, his personal characteristics, ideals, and inhibitions. Then after the discovery is made it is reasonable to expect that something may be done to bring about a more satisfactory adjustment of the student to school and society. Every area in the curriculum working on this adjustment problem will in some measure, and in some day not too far distant, perhaps, discover more and better ways of fitting the individual for the kind of life he is expected to lead in our present society. Perhaps the arts can lead the way.

[2]G. V. Sheviakov & Jean Frieberg, "Evaluation of Personal and Social Adjustment," Progressive Education Association Bulletin No. 4005.

Electric-Shop Pupil-Personnel Organization

CARL F. OBERSCHMIDT*

No teacher should devote a large portion of his time to the distribution of tools and materials when he knows that he can depend upon boys to handle these and many other shop jobs. Certainly if the students can be relied upon to take care of these types of exacting duties, they can be expected to handle other less important jobs and thus relieve the teacher of a large number of routine duties, all of which are time consuming and consequently detract from his actual teaching time.

Probably the first justification for a pupil-personnel organization lies in the responsibility that the pupil accepts in carrying out a particular duty. It is a fine thing for every boy to have some definite responsibility, especially in those school districts where many boys do not have home duties. Many parents lament the fact that they do not have home chores for their children because they live in apartments where janitor service is furnished.

Second, the teacher is relieved of numerous details of shop organization and he can, therefore, devote more time to instruction, give more individual attention to pupils, and also have more time for the improvement of shop facilities, designing of projects, construction of models, and the like.

Third, there is the important element of time to be considered. With an efficient, smooth-running pupil organization, considerable time can be saved, especially at the beginning and end of each shop period. Tools and supplies can be distributed rapidly if competent boys are assigned to tool- and supply-room duties. Numerous other jobs can likewise be handled as effectively by reliable pupils.

The particular shop organization described here did not spring up suddenly; rather it grew gradually over a period of some six or more years. The first shop jobs were three in number, toolroom, supply room, and janitor. Other duties were added from time to time as the need for them arose. At the present time there are 25 different shop jobs or duties, and all but two or three of these function during every class session.

The following is a list of the 25 jobs or duties that are in operation:

1. Toolroom.
2. Supply room.
3. Personnel assistant.
4. Attendance.
5. Timekeeper.
6. Telephone.
7. Messenger.
8. Electrician.
9. Switchboard.
10. Meters.
11. Test cords.
12. Metal stock.
13. Magnet wire.
14. Drills.
15. Machines.
16. Soldering furnaces.
17. Finishes.
18. Doors.
19. Illumination.
20. Ventilation.
21. Librarian.
22. Cleanup.
23. Safety.
24. First aid.
25. Discipline

Shop duties do not have to be coined. They exist and just naturally present themselves. For example, every teacher knows that workbenches, finishing cabinets, machines, and the like, would always be left in a messy condition if he relied upon the class as a whole to clean up. One rarely finds a class in which an individual, or individuals, take it upon themselves to assume the responsibility for this rather undesirable but nevertheless important job. The logical solution, therefore, is to appoint some one member of the class, or better still, call for volunteers, to undertake this task promptly and regularly at the end of each class period without having to be told each time. The same reasoning holds true for all of the other routine duties in a shop. Since they must be done by someone, the sensible procedure is to establish definite responsibilities and make them a part of the pupil's required work.

Over a period of years, the need for more and more pupil responsibilities became apparent, and new ones have been added at various times, until at present the foregoing list of entirely different shop duties are entrusted to pupils. About one third of these duties are considered very important, and therefore they must be assigned to pupils who are particularly competent. The remaining jobs are filled by volunteers because they do not require any special ability or experience to perform.

It is not important that every pupil be given an opportunity to serve on every job, because in many cases there is not much to be learned — rather it is a matter of having the boy accept a definite responsibility no matter how trivial it may seem. Then, too, many individuals would not care to have the responsibility involved in some of the jobs, while others would be bored with the simpler duties.

Invariably, the first question that is asked by anyone interested in this particular setup is, "how often do you change the jobs?" After half a dozen years of experiences, it appears that a system of rotating all shop jobs periodically, and shifting without regard to the pupils' capacities for performing certain duties may seem ideal, but actually it is quite impractical.

Shop teachers will agree that to keep tools in good condition, it is not feasible to let just anyone take over the control of the toolroom. Experience indicates that only the best pupils are capable of handling the toolroom efficiently and therefore, only reliable boys should be assigned to this job. As the result of this procedure, only one tool has been lost in five years.

Even with a reliable pupil in charge, it requires an almost foolproof toolroom system to function properly. Various methods of checking tools have been tried. The honor system works best. Under this system not any one individual, but rather the entire class is responsible for all of the tools. Anyone may obtain a tool without having it charged against him, but he is expected to return it. In the event, however, that he fails for some reason to return the tool, it may be returned to the toolroom by any member of the class at the ringing of the cleanup bell. Failure of a tool to show up is quickly discovered by the toolroom keeper because each tool has its own characteristic place and its absence is immediately detected by sight — no counting being necessary. The toolroom boy reports any missing tools to the class and to the teacher, and the entire group then gets busy immediately and hunts until the tool is found. This method brings excellent results, for if the tool doesn't appear before the passing bell rings, the class understands that it will have to return at the end of the day to locate the missing article. It is almost uncanny how quickly misplaced or lost tools can be recovered under this plan, which works beautifully because boys do not enjoy staying after school as a penalty.

The same reasoning holds true for the supply-room duty, for there, too, it is important to have a reliable boy in charge who will keep a complete and accurate record of all supplies given out. At the end of the report period, the supply record sheet for the various classes are checked over as the boys bring their projects to the teacher for grading.

It is advisable to appoint the tool- and supply-room boys for a period of approximately one month, and offer an incentive for the efficient performance of these duties in the form of a possible 10 extra points on the term grade. Naturally this reward attracts many students, but no pupil is selected whose grades are failing. Then, too, it is necessary that the teacher feel certain that the pupil is capable of handling the job before appointing him.

The next question usually asked is, "Doesn't the toolroom keeper lose too much working time under such a long term of service?" The shop year is broken up into required and elective work periods so that if a pupil is in the toolroom or supply room during a required project period, he can conveniently make up the work during the

*Withrow High School, Cincinnati, Ohio.

next elective period, and will manage to find time to do any extra work that he may want to do. Therefore, it does not work a hardship on a pupil to keep him on either of these jobs for a month or even a whole report period, but rather this is essential if the toolroom is to be properly taken care of and tools are not to be lost. This plan is used with ninth-year pupils only, because they report for six or eight periods for the entire year.

At present the mechanics of the personnel system is planned so thoroughly that practically every job can be put into operation during a single class period, whereas formerly it often took as long as two weeks to get the system in operation and working smoothly.

The names of the pupils by classes, and the names and numbers of the shop duties are listed on a personnel-record chart. This device consists of a rectangular box, in the center of which is an octagonal drum on which the various classes are listed. This drum can be rotated one face at a time by means of a handle attached to its axis. Fixed panels on either side of the drum housing contain the job names and numbers. The names are printed on small white cards which are held in place by card holders. This arrangement makes for flexibility as it permits the student's name to be changed about in any desired order, or new names may be added and old ones removed when necessary. It is the personnel assistant's duty to turn the drum at the beginning of each period so that his class list is visible. He likewise is responsible for making the changes in the chart at the end of each grade period by shifting the name cards on the face of the drum and making additions or deductions.

Conveniently located in another part of the shop is a job-card rack. After the pupil finds his name and job number on the record chart, he obtains the proper card from this rack numbered to correspond to his assigned duty. From this card he learns the requirements of his job and then returns it to its proper place in the rack where he may refer to it at any time in the future.

The following appears on the job-card rack:

Instructions

If you have been assigned or have volunteered for a specific shop duty, your name appears on the personnel-record chart, which is located in the office window.

Procedure

1. Learn the number of your duty from the record chart.
2. Remove from the card rack the card with your number on it.
3. Read the instructions on the card very carefully and return it to its proper place in the rack.
4. Report to the exact location of your duty and if possible go through the actual procedure explained on the card.

If any point is not clear to you, do not hesitate to ask for additional information. Remember that you are expected to faithfully and efficiently perform your special duty during each class period. The responsibility of a particular job has been placed in your hands. The success of this personnel organization depends upon the reliability and performance of you together with its other 24 members. Please keep this fact in mind at all times.

Personnel-record Chart

This year, an experiment has been made at Withrow High School electric shop in student control of discipline. Surprisingly the ideas have worked out far better than expected. Briefly, the system is this:

It is suggested to the class that they elect a disciplinarian whose duty it will be to assign conduct slips to his classmates for misconduct, or rather any of 12 different offenses which are listed on a shop-conduct-record slip. The disciplinarian is instructed to first warn the offender and then if he continues, to give him one of these slips with his name and date on it and offense checked. This slip is signed by the offender after he elects one of the four forms of punishment listed on the bottom of the slip. These records are kept by the teacher until the punishment is completed, after which they are filed in the office. The boys, knowing that their slips are kept by the teacher, are quite concerned about them and as a rule try to avoid receiving them. In general, this experiment has been very successful. On only a few occasions has it been necessary for the teacher to enter the picture when a boy or boys complained of receiving an unfair deal. Of course, there are things occasionally that the disciplinarian misses, and the teacher is obliged to write a few conduct slips or call the case to the attention of the disciplinarian.

Finally, while this shop organization is not perfect, and therefore changes and improvements are constantly being made, nevertheless it is a definite help to the teacher as well as to the classes.

Notices Posted in the Electric Shop

Magnet Wire

Magnet wire is expensive, do not waste it. Rewind unused wire on spool and fasten the end in the hole in the rim of the spool when you finish. Be sure you know correct gauge of wire needed and test a sample of the wire in the gauge before winding coils, etc.

Unfinished work may be left in rack only by special permission.

Shop Regulations

The following simple rules and precautions must be observed at all times without exception.

Important! No one may leave the shop at any time without permission, so get acquainted with the following procedure immediately.

1. You may visit your locker:
   - *a*) Before entering shop at beginning of period;
   - *b*) After ringing of *cleanup* bell at end of period;
   - *c*) At other times, when necessary by permission only.
2. You may visit other shops:
   - *a*) To obtain special tools or materials, using *shop memorandum* blank properly filled by you and signed by the instructor.
3. You may use lavatory:
   - *a*) By permission only — we use toilet facilities located within shop.

Read printed instructions located throughout the shop, concerning use of switchboard, machines, soldering furnaces and other equipment. Be extremely alert and careful while using electricity, tools and machines, remembering always that **It Hurts to Get Hurt.**

Refrain from whistling and loud talking in the shop and from any other practices that are unworthy of a high school pupil.

Gas Valve

On — Handle vertical.
Off — Handle horizontal.

Caution

Do not look into furnace while lighting burner. Place light in furnace first, then turn valve to *on* position.

Soldering Instructions

Soldering is a simple process of uniting metal with an alloy of tin and lead which melts at a low temperature.

A soldering *copper* is used to melt solder and to transfer heat to the metals that are to be soldered.

The tip of the soldering copper must be properly *tinned,* that is, covered with a coat of solder before it can be used successfully.

A copper can be tinned as follows:

1. File or sandpaper the point of the copper until it is thoroughly clean.
2. Heat the copper in gas furnace until it will melt solder. Never allow copper to remain in fire until a bluish green flame appears.
3. Rub the heated copper on a cake of sal ammoniac, or dip it in zinc chloride and immediately coat it with solder after which it is ready for use.

Always be certain that the metals to be soldered are perfectly clean and then apply a soldering flux either in paste or liquid form. The flux prevents the metal surfaces from

oxidizing and aids in making the solder flow readily.

Acid or salt fluxes should never be used for electrical work as they cause corrosion. All fluxes should be used sparingly, just enough to flow over surface to be soldered.

Remember that extreme cleanliness, a properly tinned copper, the correct flux, and ample heat are necessary for a good soldering job.

Please be careful not to burn soldering copper handles by inserting the coppers too far into the furnace.

Caution

Read instructions on how to safely light gas furnaces.

Toolroom Instructions

1. Check tools carefully upon entering the toolroom and report any broken or missing tools immediately.
2. You are responsible for all tools, and should not leave the toolroom or admit anyone without the consent of the instructor.
3. Report promptly, the failure to return any tool by the time the warning bell rings.
4. When check system is used, hang the proper check on the nail under the tool given out, and return it to the check rack when the tool is returned.
5. It is your duty:
   a) To keep all tools in their proper places on the racks;
   b) To keep all tools in good condition;
   c) To keep the floor clean at all times;
   d) To lock the door, windows, and turn out the light at the end of the period.

Supply-Room Instructions

1. All supplies that are not returned must be charged to the individual on the supply record sheet.
2. Special supplies not listed on the record sheet may be given out only by special permission of the instructor.
3. All returnable supplies and equipment must be returned at the end of the shop period.
4. Report promptly, the failure of any articles to return by the time the warning bell rings.
5. It is your duty:
   a) To keep an accurate account of all supplies given out;
   b) To keep all supplies in their proper places;
   c) To keep the floor clean at all times;
   d) To lock the door, windows, and turn out the light at the end of the period.

Job Cards

Toolroom **Job No. 1**

It is your duty:

1. To follow printed instructions posted in the toolroom.

Notice — As this is one of the most important and time-consuming jobs, it carries a reward of 10 extra points on the term grade for the efficient handling of the toolroom system and the proper care of tools and toolroom.

Supply Room **Job No. 2**

It is your duty:

1. To follow printed instructions posted in the supply room.

Notice — As this is the second most important and time-consuming job, it carries a reward of 5 extra points on the term grade for the efficient handling of supplies, accurate supply records, neatness and order in the care of supplies and the supply room in general.

Personnel Assistant **Job No. 3**

It is your duty:

1. To turn the personnel device so that your own class appears daily.
2. To check up on students to see that they do not neglect their assigned duties.
3. To change name cards when shop duties are shifted.
4. To assign substitutes to take over the duties of absentees for the duration of their absence.

Attendance **Job No. 4**

It is your duty:

1. To walk down center aisle and record numbers of vacant seats.
2. To collect absence excuses for previous day's absence.
3. To return signed absence excuses to students.
4. To check attendance at end of period occasionally.
5. To give names of absentees to the personnel assistant, so that he can assign substitutes.

Important — This job must be done accurately so that no absence ever goes unrecorded.

Timekeeper **Job No. 5**

It is your duty:

1. To ring cleanup bell (located under instructor's bench) three times according to time schedule posted under clock.
2. After ringing bell, to see that all students begin immediately to clean up benches, return tools and supplies, and put projects in lockers. Report anyone who fails to comply with above rules.
3. Ring bell at other times when instructed to do so for other reasons, such as to read notices, give additional instructions, etc.

Telephone **Job No. 6**

It is your duty:

1. To answer telephone.
2. To deliver messages to other shop, teacher, student, or other person that call concerns.
3. To call office and obtain altered time schedules when class periods are omitted or shortened.

Messenger **Job No. 7**

It is your duty:

1. To deliver messages to the office or to other teachers or shops.
2. To call for, or deliver materials or tools to or from other shops as they are needed.
3. To go on errands of any nature that may be necessary.
4. To guide visitors, new students, or others through building.

Electrician **Job No. 8**

It is your duty:

1. To take care of miscellaneous repair jobs for other teachers and for students from other shops or classes.
2. To repair extension cords, test cords, and other appliance cords, plugs or switches.
3. To assist new students who may need aid in testing, using meters, obtaining proper voltage, etc.

Switchboard **Job No. 9**

It is your duty:

1. To place any desired voltage on workbenches as requested.
2. To notify occupants of benches each time a voltage change is needed.
3. To be able:
   a) To locate defective fuses.
   b) To refill fuses.
   c) To replace defective fuses.
   d) To test for voltages on benches.

Important — This is an important duty. Be certain not to make any mistakes, check yourself each time a change is made, to avoid causing damage or accidents.

Meters **Job No. 10**

It is your duty:

1. To take charge of all meters.
2. To give them to reliable students only.
3. To return all meters to their proper places in the office as soon as the user gets finished with them.
4. To be able to show class members how to properly connect all kinds of meters.

Important — All meters are extremely delicate and very costly, so see that they are treated with the greatest of care.

Test Cords **Job No. 11**

It is your duty:

1. To return all test cords to the supply room at the end of the period.
2. To check cords daily to see that they are in good working order.
3. To see that test cords are properly used, especially that clips are attached to device being tested before the attachment plug is inserted into bench switch.
4. Report to the safety director, the name of any student who fails to observe instruction No. 3.

Metal Stock **Job No. 12**

It is your duty:

1. To give out bar and tubing stock as it is needed.
2. To return unused metals at end of period to their proper places.
3. To see that waste is reduced to a minimum.
4. To see that metal cabinet is always in good order.
5. To see that cabinet door is closed at end of period.

Magnet Wire **Job No. 13**

It is your duty:

1. To keep wire spools filled.
2. To see that wire is not wasted.
3. To see that wire ends extend through holes in base of cabinet.
4. To see that no partially wound coils are left in cabinet without permission of instructor.
5. To see that cabinet is closed at end of period.

Drills **Job No. 14**

It is your duty:

1. To check the drill-holder block to see that all the drills are in place.
2. To return all drills to the drill-holder block at the end of the period.
3. To report broken or missing drills immediately at the ringing of the cleanup bell.
4. To report any burned, dull, or broken drills at end of each period.

Machines **Job No. 15**

It is your duty:

1. To oil all motor and machine bearings daily.
2. To wipe excess oil from machines.
3. To report improper use or abuse of any machines to instructor.
4. To report to safety director any student who is careless about the use of any machine.

Soldering Furnaces Job No. 16

It is your duty:

1. To light pilot light on bench.
2. To see that students light gas furnaces according to instructions.
3. To keep soldering paste and acid containers filled.
4. To see that soldering coppers are not overheated.
5. To see that soldering furnace valves are not turned on too far so that flames spread out from under hood.
6. To see that soldering handles are not burned by excessive flame from the furnace.
7. To turn off main gas valve at end of period.

Finishes Job No. 17

It is your duty:

1. To keep the finishing cabinet in order.
2. To keep the various containers filled.
3. To see that brushes are kept in their proper solvents.
4. To see that glue can is returned at end of period.
5. To close cabinet doors at end of period.
6. To see that no oily waste or rags are left in the cabinet.

Doors Job No. 18

It is your duty:

1. To close shop-to-hall door after ringing of tardy bell at beginning of period.
2. To close office door.
3. To close shop partition door.
4. To see that hall door is closed during period if it has been left open by a visitor or member of some other class.

Illumination Job No. 19

It is your duty:

1. To turn lights on upon entering the shop (when needed).
2. To turn lights off upon leaving the shop.
3. To turn lights on in the following order:
   First — group nearest blackboard;
   Second — group in center of shop;
   Third — group nearest windows on extremely dark days only.

Ventilation Job No. 20

It is your duty:

1. To open windows when need for ventilation becomes apparent.
2. To close windows when temperature in shop drops below 68 deg.
3. To open windows above soldering furnace bench first in order to exhaust gas fumes and hot air from gas furnaces.

Librarian Job No. 21

It is your duty:

1. To see that no prints, charts, etc., are taken from bulletin board.
2. To collect pamphlets or other printed matter and return them to the proper places provided for them.
3. To check up on textbooks so that they are not taken from the shop at any time without permission.

Cleanup Job No. 22

It is your duty:

1. To brush vise and soldering benches clean at the end of the period.
2. To place all waste materials in the trash can.
3. To see that benches No. 1, 2, and 3 are cleaned by the students occupying them.
4. To insist that students put paper towels in can provided for them, instead of on the floor.

Safety Job No. 23

It is your duty:

1. To see that no one engages in any practice that may result in injury to himself or other members of the class.
2. To watch especially the following:
   a) Carless use of grinder.
      (1) Grinding pieces too small to hold securely.
      (2) Failing to use glass safety shields or looking around them.
      (3) Tool rests loose or improperly set.
   b) Improper use of test cords and other electrical equipment.
   c) Careless use of sharp cutting tools, screw driver, etc.
   d) Careless use of drill press, sander, grinder, or lathe.
3. To caution students about the danger of ties, sleeves, aprons, being caught in machinery.

First Aid Job No. 24

It is your duty:

1. To see that first-aid kit is in order and that the necessary supplies are always on hand.
2. To report all accidents to instructor no matter how trivial they may seem.
3. To apply antiseptic solution, and bandage wounds with gauze or apply Mercurochrome pads.
4. If instructor considers it necessary, to accompany injured student to school doctor or nurse for further medical attention.

Discipline Job No. 25

It is your duty:

1. To call students' attention to singing, whistling, loud talking, scuffling, loafing or any other disturbance that tends to disrupt the class.
2. To present student with conduct slip properly filled in, and obtain his signature and choice of punishment on it.
3. To seek aid or advice from instructor in difficult cases which you do not feel capable of handling satisfactorily.

THINGS TO THINK ABOUT

R. W. Selvidge*

In so far as learning is a conscious purpose, we deal with specific things.

Experience is the basis of all learning, but what we learn depends upon our interpretation of the experience.

Out of the infinite number of potential experiences which the future holds, we may, in a large measure, select those which will contribute to our happiness, our usefulness and our success.

The choice of these experiences, or their modification, depends upon our intelligence and the wisdom with which we interpret our past experiences.

We cannot change the experiences which have slipped through the instantaneous present into the past. We can only interpret them so as to enable us to choose more wisely, or control more effectively, the experiences which the future will bring us.

*University of Missouri, Columbia, Mo.

THE STEAM SHOVEL

R. R. Bedker*

Are you one of the many who enjoy watching a steam shovel removing the dirt for the basement of a house or the foundation of a skyscraper? Are you a sidewalk superintendent? Do you help, figuratively speaking, to manipulate the levers in the cab? Don't be ashamed if you do. It must be fascinating to many, because a steam shovel in operation causes traffic to slow down and men and women, boys and girls, to be late for appointments.

Watching this lifelike machine is too absorbing for most of us to resist. It creates probably as much sustained interest as would the man on the flying trapeze. One man with magic touch manipulates the almost huge jaw of steel to bite out a piece of earth here, and put it into a truck there. This human steel caterpillar crawls along to seemingly inaccessible places with its plodding boots. This Frankenstein of steel is handled as easily as a dentist's drill, with more interest to nonoperators as it causes no pain. It appears able to do almost anything except climb a vertical steel beam. Its power and cunningness seem unlimited and unbelievable to spectators.

That the shovel was but a presentation on paper a few years ago is hard to believe. The engineers and draftsmen planned, designed, made, scrapped, replanned, redesigned, and remade the steel shovel until it crawled right out of the drawing board like a Walt Disney picture. The lines and symbols used in mechanical drawing bring to life the ideas and thoughts of the engineer or draftsman just as the English language conveys ideas to all of us.

Mechanical drawing is the living graphic language of our industrial world.

*High School, Wauwatosa, Wis.

EXPERIENCE IN THE INDUSTRIAL ARTS

Gives balance to an intellectual person. Serves as a test of accuracy and honesty in thought and workmanship.

Helps in understanding and dealing effectively with the industrial environment we live in.

Produces a trained eye which will recognize, enjoy, and demand beauty of line and harmony of color.

Provides a means of using leisure time satisfactorily and profitably; and for relaxation in times of stress.

Helps create a better understanding of the work of the craftsman, artist, and laborer.

Develops industriousness, patience, thrift, neatness, foresight, and forethought.

Demands the best in a person and enables him to lead a fuller life.

— *Homer C. Rose.*

The Eight Big 8's in Industrial Education

R. T. CRAIGO*

From previous experiences in the engineering, construction, and manufacturing fields, followed by many years in trade and industrial teaching, the writer has gradually crystallized some views which may be of interest and use to those in the field of vocational or industrial education.

The shop instructor, the supervisor, and the principal or director may change from one shop, or school, or system, to another. Therefore, it is very important to know what are the various kinds of schools, shops, jobs, and tools; also what common factors, elements, or units apply to all shops, trades, schools, and jobs.

This brief article attempts to list and briefly discuss these common factors, elements, or units.

Industrial Education has two main subdivisions:

1. Trade and industrial work.
2. Industrial arts.

Both of these subdivisions may be considered to have four basic objectives:

1. *Skill* in the use of tools, machines, operations, and processes.
2. *Knowledge* — job, shop, trade, related.
3. *Reasoning* — the use of knowledge.
4. *Attitude* — appreciation of tools, machines, stock, jobs, and authority, resulting in improved work habits.

The workman on the job has constant use for these same objectives.

Eight Types of Schools

1. *Grade School* — Industrial-arts shops;
2. *Junior High School* — Industrial-arts shops;
3. *Senior High School* — Industrial-arts shops and vocational training departments;
4. *Junior College* — Industrial-arts shops and vocational training departments;
5. *Normal School or College of Education* — Instructor, training for industrial arts and vocational education;
6. *Engineering or A. & M. College* — Shops for engineering courses;
7. *Trade School* — Unit and multitrade shops;
8. *Commercial Shop* — Primarily for production, part-time education, apprentice courses, vestibule training, training on job.

Eight Types of School Shops With Some of Their Objectives

1. *Trade Finding* — (*Prevocational*) — Diagnostic, self-discovery, exploration, guidance.
2. *Industrial Arts* — General education, appreciation, consumer values, cultural values.
3. *General Shops* — Diversified and general vocational experiences, trade tryout, reservoir, advisement, opportunity group.
4. *Trade Preparatory* — To fit for useful employment, get a job, hold a job, secure promotion. To give the students necessary trade skills, trade knowledge, reasoning ability, desirable attitudes.
5. *Trade Extension* — Specialized advanced training in a trade to keep abreast of trade progress and methods. Encouragement of controlled research and experiment.
6. *Instructor Training Shops* — To train in teaching technique; to give a broad general education; to develop the instructor in specific fields in: (*a*) skills; (*b*) knowledge; (*c*) reasoning; (*d*) attitudes.
7. *Engineering Shops (A. & M. Colleges)* — To give knowledge and appreciation of shop processes for design, operation, management, and research. To turn out production.
8. *Outside Commercial Shops* — To train the employees in the very specific skills, methods, procedures, tools, and processes for that specific shop.

Eight Types of Jobs

The workman on the pay-roll job must perform work jobs. These work jobs include one or more of the eight types.

In all school shops these same eight types of jobs are met daily.

The workman and the foreman, the student and the instructor, must make allowances for the different inherent characteristics and requirements called for in these eight different types of jobs.

The tool, machine, and stock requirements must also be taken into consideration.

Eight Types of Work Jobs — Not Pay-Roll Jobs

Eight types of jobs, their basic requirements, fundamental operating steps, and trade knowledge requirements, precautions, and basic procedures.

1. *Disassembly — Assembly* — These include fitting and adjusting.

Involved are the order of disassembly, inspection, and checking while down, and order of assembly.

2. *Repairing* — This includes replacements, adjustments, and the like.

Repairing frequently is preceded by No. 1. Calls for judgment on when to repair or replace a part, how to test, and so forth.

3. *Operating* — This includes oiling, inspecting, starting, adjusting, and stopping.

Calls for sense of hearing as well as seeing and feeling. Sometimes sense of smell is needed. Sometimes merges into No. 4.

4. *Testing* — This calls for readings of speed, temperatures, current, deflection, and the like.

Testing usually involves two variables: speed versus gasoline consumption; deflection versus load; voltage versus current.

5. *Forming* — This involves hot or cold bending and shaping processes.

Forming are the processes met with in the blacksmith and sheet-metal shops.

6. *Production* — This involves making or producing something.

Production jobs call for the machine operator who has acquired skill in performing operating jobs. Production merges frequently into No. 3.

7. *Technical* — This includes drafting, designing, estimating, and inspection.

These jobs make a heavy demand on mathematics, drafting, applied science, and often call for trade English.

8. *Miscellaneous*

In Detroit, automobile training must emphasize No. 6, production jobs, while in Minneapolis automobile training emphasizes No. 2, repairing jobs, and No. 3, operating jobs.

In cities like Buffalo and St. Louis, airplane mechanics training calls for No. 7, technical jobs, and No. 6, production jobs; while in Rantoul, Illinois, the call is for No. 1, disassembly-assembly jobs, No. 2, repairing jobs, and No. 3, operating jobs.

Sheet metal is rapidly changing from No. 5, forming jobs, to No. 6, production jobs. The small sheet-metal jobbing shop is seriously rivaled by the large production shop turning out elbows, pipes and fittings on machines (i.e., production jobs). This, in turn, calls for changing the sheet-metal training from forming jobs No. 5 to technical jobs No. 7 and operating jobs No. 3.

Eight Types of Tools

A careful study of the tools in the toolroom or in use on the job or in the shop often reveals that one or more of the eight types of tools may not be completely represented.

Take the type "measuring tools." It will be interesting to see what they are in your own shop.

Among the measuring tools in the *bakeshop,* for instance, one would find thermometers; in the *machine shop,* the telescopic gauge and the hardness gauge; in the *auto shop,* the revolution counter, temperature type hydrometer; in the *oil burner shop,* the Orsat apparatus; and in the *welding shop,* the tensile strength tester.

Does the shop student or workman have and know how to use the best marking tools? How about holding tools? Are the

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vises equipped with copper jaw faces to protect finished jobs?

Take all of the eight types of tools from the following list and check them against your tool crib or shop.

The eight different kinds of shops and the eight types of jobs call for different tool setups.

Eight Types of Tools

1. Measuring
2. Marking
3. Cutting
4. Sharpening
5. Holding
6. Driving
7. Finishing
8. Forming

Big Eight Related

In all shops in industry and in the school, it is necessary for the efficient workman or student to acquire and use related knowledge applied to:

Tools, machines, material, supplies, processing and operating, advisement and industrial business. Various names are used to cover this knowledge, such as: related, functioning, job, trade, shop mathematics, shop drawing, applied, useful, shop, technical, shop science, shop English.

The shop instructor on the shop floor or in a separate related classroom must include all of the following eight.

Big Eight Related

1. *Tools* — Their cost, sizes, dimensions, finish, uses, care, kind, materials. All may be treated mathematically, or in applied science or shop drawing and sketches.
2. *Machines* — Facts on lubrication, power, speeds, feeds, adjustment, capacity, disassembly and assembly, maintenance and production.
3. *Materials* — Information about color, sizes, weight, finish, ductility, malleability, hardness, kinds, uses, substitutes.
4. *Supplies* — These are often called "stock," and one must know about quantities, packaging, conservation.
5. *Processing* — Processing stock may be done by hand or machine, chemically or electrically. Storage of stock must also be studied.
6. *Operating* — The operation of machines and tools, lubrication, inspecting, starting, adjusting, stopping, and the like.
7. *Advisement* — This involves information about trades, the pay-roll job, upgrading, and the qualifications of man *versus* job specifications.
8. *Industrial business* — This introduces such terms as cost, time, power, overhead, material.

Eight Instructional Methods

1. Discussion — (Tell)
2. Demonstration — (Show)
3. Laboratory or Experimental — (Do)
4. Book Study
5. Project
6. Lecture
7. Drill
8. Four-step development lesson

Educators have developed the *Eight Instructional Methods* used in general education. However, in trade and industrial training three of these or their modifications best meet requirements in shop:

The Three Instructional Methods Used in Training

Tell — explaining the how, why, what, where, when.

Show — the shop demonstration.

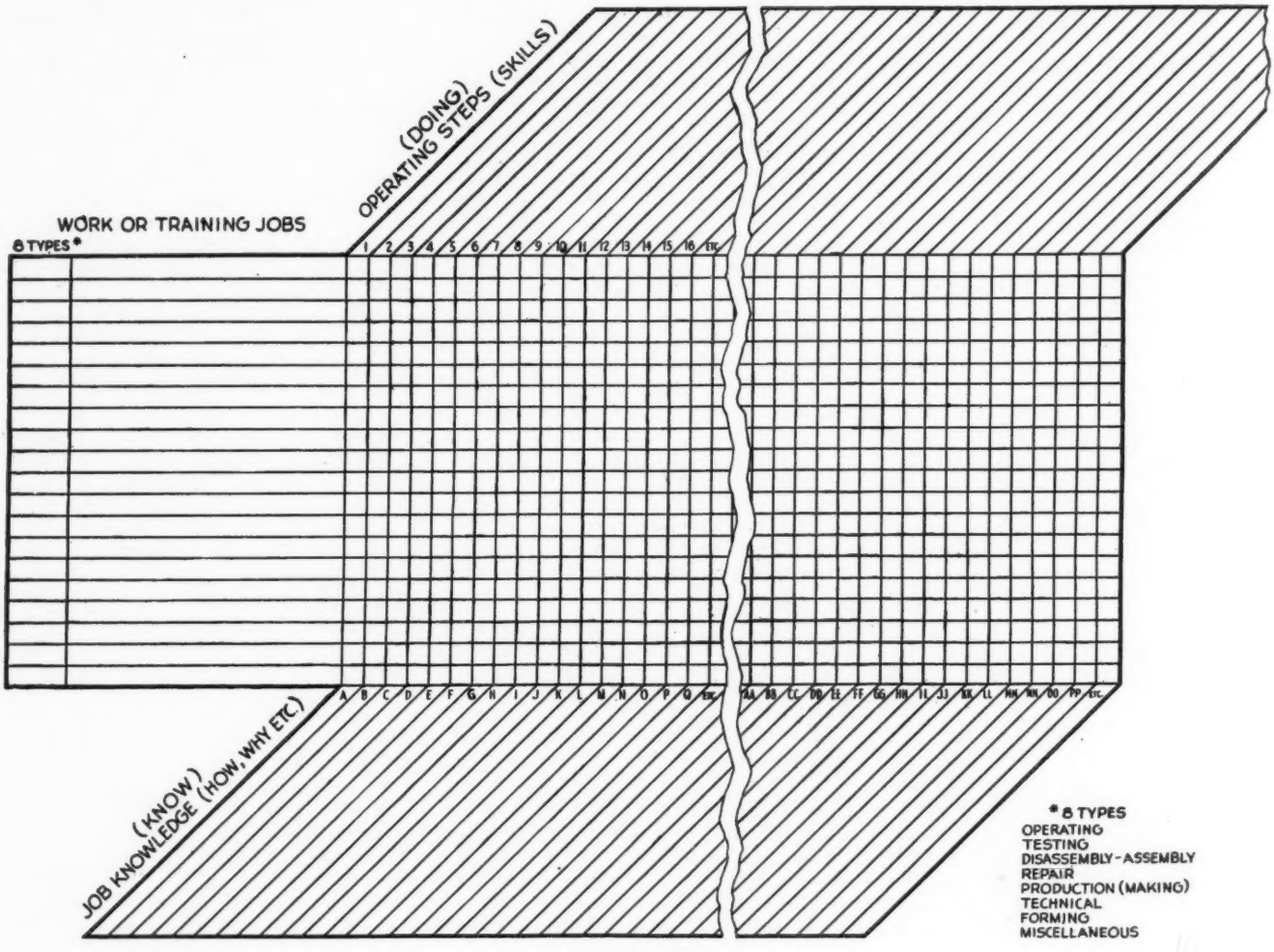
Do — the student "does it."

In related classwork, the best method is the four-step development lesson: preparation, presentation, application, and test.

The eight instructional methods call for eight instructional devices listed later on.

The Big Eight of Learning

Both instructor and student should keep in mind the *big eight of learning:*


(DOING)
OPERATING STEPS (SKILLS)
WORK OR TRAINING JOBS
8 TYPES *
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 ETC
A B C D E F G H I J K L M N O P Q ETC
AA BB CC DD EE FF GG HH II JJ KK LL MM NN OO PP ETC
(KNOW)
JOB KNOWLEDGE (HOW, WHY ETC)
* 8 TYPES
OPERATING
TESTING
DISASSEMBLY - ASSEMBLY
REPAIR
PRODUCTION (MAKING)
TECHNICAL
FORMING
MISCELLANEOUS

Job-Analysis Chart

1. Readiness
2. Exercise or practice
3. Results
4. Law of association
5. Relevency
6. Intensity
7. Frequency
8. Recency

Eight Instructional Devices

The instructor has certain "tools" or devices he should know and use. These *eight instructional devices* follow:

1. Spoken word
2. Written word
3. Charts
4. Panels
5. Slides (Films)
6. Models
7. Sectional equipment
8. Real equipment

The most important topics or subjects should be accompanied by all eight of these devices. For example, grinding a lathe tool in machine shop, timing an engine in the automobile shop, or winding an armature in the electrical shop should utilize all of the *eight instructional devices.*

The Eight M's in Management

In industry, as well as in trade and industrial training, we frequently meet with the word, *management;* production management, office management, shop management, and classroom management.

Since this activity is of increasing importance both in school and shop, it would seem desirable to briefly discuss this subject:

1. Management involves the 8 M's of men, machines, money, morals, materials, markets, management, methods.

2. The American Society of Mechanical Engineers has adopted a standard definition: "Management is the art and science of preparing, organizing and directing human effort applied to control the force and utilize the materials of nature for the benefit of man."

Art involves *getting things done.* Science involves *the reasons why things are done,* and is often spoken of as the *how and why.*

For the benefit of man is, after all, the chief objective of all management. The recent trend in industry is to place ever increasing emphasis on this objective.

As employees are promoted to positions of greater responsibility, they are assuming greater responsibilities in the field of management.

Eighteen Motions in Industry

All skills, operating steps, and "doing" call for one or more of *eighteen basic motions,* nine right and nine left. These involve fingers, hand, wrist, elbow, shoulder, neck and back, ankle, knee, hip.

Each skill or operating step in shop should be checked to see that only the correct motions are used. Heavy lifting is best done with leg, not back, motions; elimination of neck motion in fine assembly work is desirable; filing, sawing, and hammering call for elimination of incorrect motions; the decided increase in number of bricks laid per day and the decided reduction in fatigue are only a few cases given to illustrate the need for careful consideration of this factor.

Four P's in All Jobs

All jobs may be analyzed into 4 P's:

Procure: tools, stock, plans.

Place: stock and tools — also includes jigs, fixtures, vises, stops, and the like.

Process: calls for certain skills and operating steps.

Put away: tools, finished jobs, scrap, plans.

Job Analysis Chart

The Job-Analysis Chart shown here, has materially aided in the efficient and effective training of students.

In the first column on the left are listed the eight types of jobs met with in all training. In the second column on the left are listed the work jobs or training jobs.

To the right up above are listed the skills or operating, or *doing* steps.

At the bottom of the page are listed the required job knowledge or shop knowledge, that is the *how and why.*

In each square, numbers show the skills or operating steps (above), and letters show the necessary job knowledge (below).

Where Does the Project End?

WILLIAM J. DOHERTY*

The schools of America are doing excellent work in both shop and academic subjects. Training for citizenship is also awakening students to a realization of their present and future duties and responsibilities.

Yet, even with all the progress being made in these different educational lines, teachers and supervisors, particularly of high and trade schools, might ask themselves a few questions about their work, the neglect of which may bring discredit upon their pupils or upon their school. A large number of questions might be asked, but the following three may suggest others:

1. Is the odor of burnt tobacco noticeable in the basement of the school?

2. Do pupils smoke at the school entrances before school, and do they light up cigarettes at the school door upon dismissal?

3. Are members of the class chewing gum during classroom hours?

Sometimes it is felt that school officials must relegate the smoking question to the back of their minds, but school committees generally state that there shall be no smoking in school buildings, and there are also the fire laws to be considered. Apart from that, it is not felt that the school's reputation is added to if boys are smoking just outside the school, or if the odor of smoking is noticeable in the school building. School committees usually rule that the school has jurisdiction over pupils from the time they leave their homes until they arrive back there after the school session; so some consideration must be given the matter.

At the Mechanic Arts High School, Boston, which has an enrollment of over 1600 pupils, the boys handle the matter themselves by means of their student council. This council has set up the rule that boys must not smoke inside of a certain "triangle" formed by streets near and enclosing the school. Student-council patrols are used under the supervision of teachers; but it is safe to say that if the patrols were withdrawn for a time, boys would not smoke within that area. They seem to have developed self-control in that respect, and apparently realize that they are upholding the school's reputation.

Some teachers regard gum chewing as something that can be passed by without comment; yet those same teachers would probably agree that exployees in business and industry who must meet customers all day long, usually feel that as representatives of their firm, they may not chew gum during business hours.

In visiting schools, it is very easy to notice the aftereffects of gum chewing. The corridors and floors are stained with black splotches where the gum has been trampled down, and the unsightly marks cannot be removed with ordinary sweeping.

Theater associations have found that the removal of chewing gum, "parked" under and on chairs, costs thousands of dollars annually. A cleaning fluid manufactured especially for the purpose is required to remove the gum, and in some large theaters each seat is gone over nightly. Signs requesting patrons not to "park" their gum have proved ineffective, and there is nothing to do, apparently, but to keep on cleaning. Are the schools lax in their training if no effort is made to have our future citizens think of this matter?

Teachers sometimes tell their classes how gum chewing will deface the building, and how unhygienic it is to live in a place where so much chewed gum is lying around. But when the gum chewing continues, they wonder what use it is to

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bother any more about it. The writer solved this difficulty some years ago in his classes by having the gum chewers do a little thinking about it themselves. It was announced that an imaginary concern known as the Chicle Manufacturing Company was being formed in the school. Boys chewing gum in class were to be enrolled as workers each time they were found chewing gum. Their duties were to collect, with a scraper, a certain number of pieces of chewed gum from the floors or corridors of the building. It was stated that if a means of renovating the old gum was found, they would also be given this job! It is a pleasure to state that the scrapers have been idle for a long time, as there are not any workers to use them.

MEMORY MOLDS

(Continued from page 422)

spirit of Christmas should be built around a child. With the birth of that Child began the forming of the mold for the perfect life. Through His life and through the centuries, that perfect mold has remained the measure of life and character. Memory is the device by means of which the measure may be repeatedly taken. Only by constant reference to that Master mold, and continued use of the best molds which memory has produced, will there come forth from the chaos of life a spirit of good will and peace, a willingness to help others bear their burdens, and to make personal sacrifices so that others may be happy.

Problems and Projects

SCOUT NECKERCHIEF SLIDE

E. L. Longley,
University of Maryland,
College Park, Md.

The neckerchief slide is part of the uniform of every scout. Usually they are braided cord and purchased in most cases from a supply house. The design for the slides shown and described in this article originated while searching for some use that could be made of the corners which are left after cutting out circular disks for trays or bowls.

Figure 1 shows how to cut out the blanks for various size slides and Figure 2 shows a slide which has received much student acclaim. The slide may be enriched in many ways with background decorating tools, peening, repoussé work, or appliqued designs.

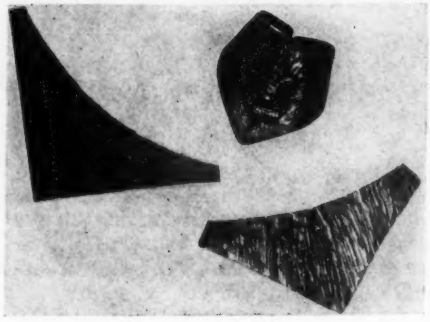


Fig. 2

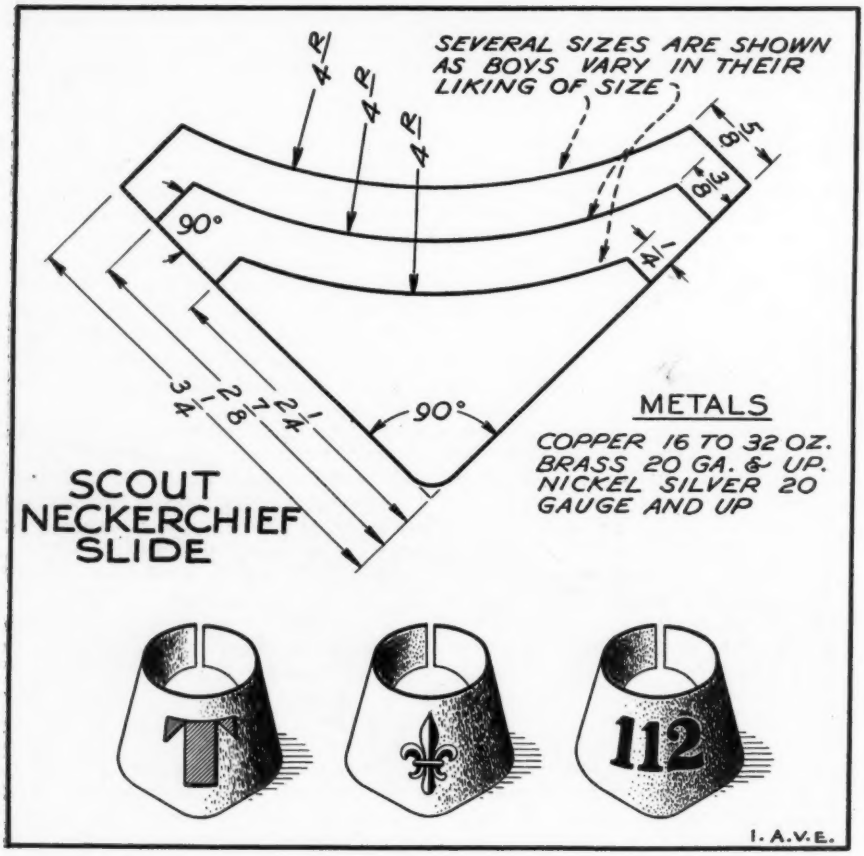


Fig. 1

Tools and equipment. Snips, files, ball-peen hammer, soldering equipment, blow horn stake, and a mallet.

Besides the metal that is to be used for making the slides, the following materials will be needed: steel wool, buffing materials, coloring materials, and lacquer or wax.

General procedure. Cut or finish the pattern, file, clean or polish, peen or ornament, form, color and wax, or lacquer.

DOOR CHIMES

Harry R. Wilson,
Eastern High School,
Lansing, Mich.

The chimes, or double gong, are so constructed that pressing the doorbell switch will strike one tube, and releasing the switch, will strike the other. The chimes consist of a wooden head, as shown in Figure 1, a solenoid consisting of a brass tube, Figure 3, wound with No. 12 enameled wire, and a loosely fitting movable iron core with brass end as shown in Figure 2. The backing and covering of the head is of three-ply wood. The method of assembly is shown in Figure 4. The wiring diagram is like that of the usual doorbell and is shown in Figure 5.

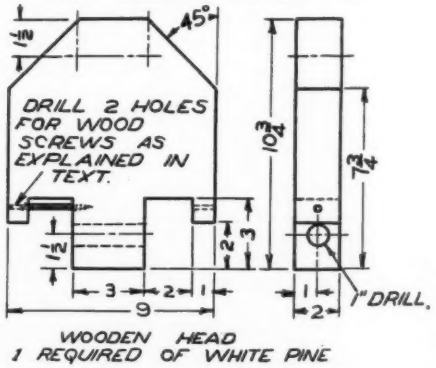


Fig. 1. The detail of the head

The operation of the chimes is as follows: On pressing the door button, the plunger is sucked into the center of the coil but the force of inertia causes it to overshoot the center and ring the tube. Then the magnetic

lines of the coil bring it back to the center and it remains there until the electric circuit is broken by the release of the switch at the door. When this switch is released a rubber band, stretched between the front and back covering of the head, as shown at RB in

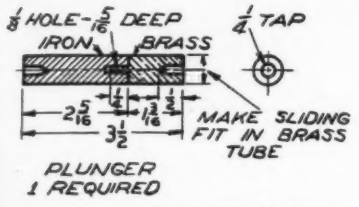


Fig. 2. The solenoid plunger

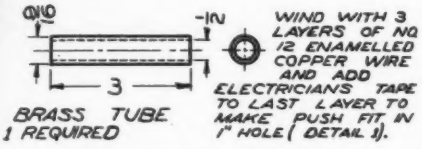

Ø1/0
1/0
3
WIND WITH 3 LAYERS OF NO 12 ENAMELLED COPPER WIRE AND ADD ELECTRICIANS TAPE TO LAST LAYER TO MAKE PUSH FIT IN 1" HOLE (DETAIL 1).
BRASS TUBE
1 REQUIRED

Fig. 3. The solenoid tube

Figure 4, pulls the plunger out of the center of the coil and the elasticity of the rubber causes it to strike the second tube and rebound to the position where it is held by the rubber, until the door switch is pressed again. The rubber band is double and is stretched between the front and back panels of the head in line with the end of the plunger, holding the plunger about ⅛ in. from the tube. The pin which holds the band through the hole in the panel may be twisted to increase the tension of the rubber. The ¼-in. screw and washer at the end of the plunger will hold the band stretched across. The two wood screws which support the tubes, have their heads cut off and a saw cut made in the end to allow for a screw driver to be used when they are screwed in position. Screwing and unscrewing these will give some adjustment in fixing the position of the tubes in front of the plunger.

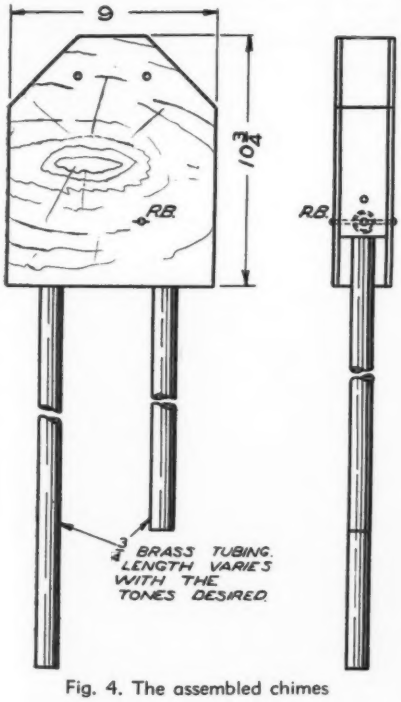


Fig. 4. The assembled chimes

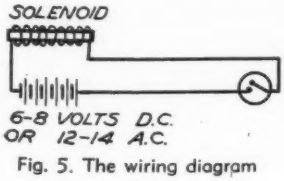


Fig. 5. The wiring diagram

EGYPTIAN HOUSE MODEL

Jacob J. Weitzenfeld,
Instructor in Drawing,
Harold E. Schofield,
Supervisor of Mechanical Drawing,
Philadelphia, Pa.

A project that should appeal to many groups, both young and old, is the construction of a house, made to scale, representing a phase of architecture of the past. Through such a problem, the student gets a fine idea of the habits and constructive abilities of the people living in the past, and acquires an understanding of them and their times.

The University of Pennsylvania Museum has made careful studies and records of many of these past ages and has accurately reproduced sets, printed on heavy cardboard, ready to be colored, cut out, and put together. The museum also furnishes wooden beams and columns, historical data, and construction and coloring directions to supplement the cardboard sections. These are produced without profit and are available to schools at cost.

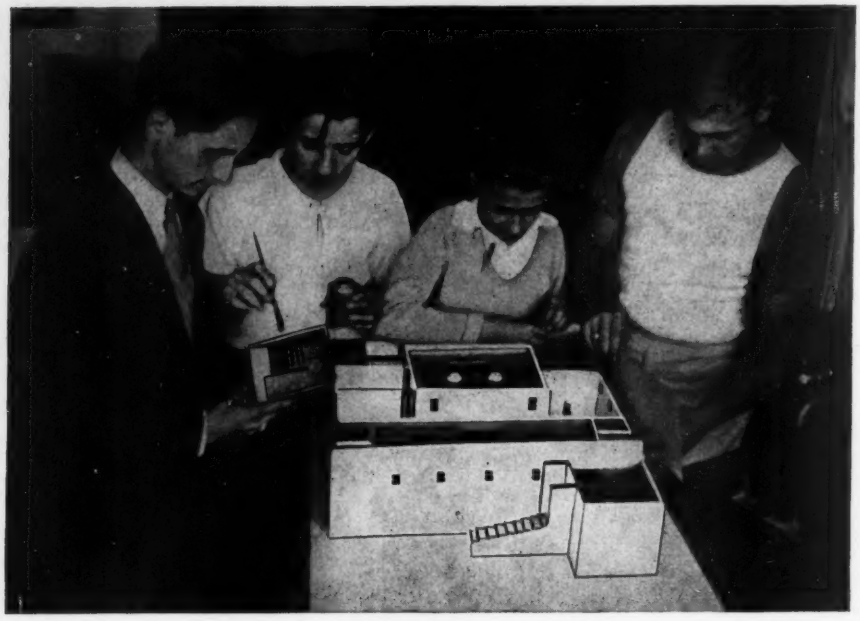
A Roman house was built by the Latin club of the school two or three years ago, and a medieval house at one of the city's other high schools. A group of boys at the West Philadelphia High School constructed an Egyptian house. They belonged to an architectural club that met once a week after school hours. They were not unusually talented in art, but they were reliable, intelligent, skillful boys.

By reading the instruction booklet, they learned that the house they were working on represented a typical Tell el Amarna house of the New Empire (1400 B.C.) and that this type was the average dwelling of the upper classes of that age.

The plan is nearly square, and divided into three increasingly private sections: (1) the vestibule, and north loggia, flanked by small store or reception rooms; (2) the main hall with its clerestory, flanked by stairs and storerooms on one side and a small loggia on the west; and (3) the private sitting room with its small bed or storerooms, bath, and master's bedroom. The broad, flat roof, surrounded by a parapet, was extensively used for recreation and sleeping in summer. See Figure 1. The floors were of brick or tile, walls of sun-dried brick, plastered inside and out. The usual dwelling of this type stood on

North Loggia, or main entrance hall

Main Hall — Angular View



Four of the boys at work on the model

a fairly large piece of ground and was surrounded by smaller buildings and courts, used for servants' quarters, storerooms, granaries, workrooms, bake ovens, and stables. There was also usually a large garden and pond. The model shown here included only the main building and forecourt.

After the first two afternoons' work on the model, the boys decided to visit the University of Pennsylvania Museum. Here they had firsthand views of Egyptian architecture of various kinds, and access to several books on Egyptian art. Greatly stimulated, they then plunged into work on their house in good earnest. First they cut out the various sections. They then did the coloring, using opaque water color, which more nearly gives the effect of the kind of color used by the Egyptians. They mixed a dull, greenish color to resemble Nile mud for the walls that were to be plastered with mud.

When they were ready for the actual construction, a wooden base was made by one of the boys in the mechanic-arts course. The base was about 3 in. high and large enough to include the forecourt. This gave the whole model a more solid foundation. Strips of gummed paper tape held the walls of each room together; the walls of adjacent rooms were glued together with a good liquid glue.

The stairway to the roof was a little more difficult, but in the end it, too, was constructed so that everything fitted together perfectly. Figures of Egyptians, furniture, jars, stands, and other accessories were then put in their proper places, these objects having previously been colored. The base was then stained, and the ground covered with sandpaper to represent sand. If desired, a larger base could be constructed to show more vegetation and sand.

The Egyptian house is now the property of the school, to be used by the art and history classes to help make more concrete the students' knowledge of Egyptian life. The photographs of the house were taken by William Woods, a member of the school's camera club.

SOLDERING EXERCISE

G. L. Simnicht,

High School,
Elk River, Minn.

Material

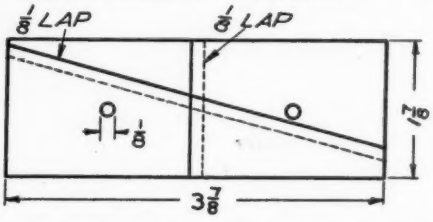
Two pieces of tin 2 by 2 in., flux, solder, emery cloth.

Tools

Tin snips, rule, scriber, punch or drill, soldering copper, tinner's furnace or blowtorch.

Procedure

1. Use the scriber and rule to draw diagonals on each piece of tin.
2. Use punch or drill to make a ⅛-in. hole at the intersection of the diagonals.



3. Hold the tin on edge of board or bench to clean a ¼-in. joint on one edge of each piece. Use emery cloth.
4. Apply flux to cleaned joints.
5. Tin soldering copper.
6. Overlap pieces ⅛ in. and *sweat* solder into the joints.
7. Clean holes by revolving emery cloth in the hole.
8. Solder holes by revolving the copper in the hole.
9. Use tin snips to cut the two soldered pieces diagonally.
10. Clean ¼-in. lap on each piece as in step 3.
11. Apply flux to joint as in step 4.
12. Have the joint fit tight and sweat in solder as in step 6.
13. Write your name on the project or exercise and hand it in at the desk for credit.

PREPARING WOOD SURFACES

Ernest Pieri,

Junior High School,
Fort Bragg, Calif.

To get a credible finish to the surfaces of the wood, the wood must not only be sanded until it is clean, but must be absolutely smooth. Wood properly finished will have a slight gloss, a gloss more pronounced in the hardwoods. To obtain this, several essential things must be taken into consideration, namely:

Essential 1. Good Sandpaper

Sandpaper is not made from sand as the name implies, but of a sharp abrasive material glued on the paper or on cloth.

Garnet particles are not as sharp as flint but will retain their sharpness longer and will not clog up the sanded fibers as will the flint particles. For this reason garnet paper is better than flint paper for sanding most woods, especially the hardwoods. The garnet particles are much harder and consequently will stand up under hard sanding much better. Both types of sandpaper are made in a wide variety of grades from the very coarse, or No. 5, to the very finest, or No. 6/0. For the school, the group most commonly used will range from No. 2 to No. 6/0.

The finer grades of sandpaper are not used ordinarily for smoothing wood surfaces, but are used for smoothing varnish, shellac, lacquer, and other finished surfaces. This paper is commonly called Speed-wet, or Wet-or-dry sandpaper, since it is manufactured so that it can be moistened with oil, water, or gasoline, depending upon the finished surface to be sanded. Gasoline is used to moisten the paper when sanding lacquered surfaces, although water may also be used. Rubbing oil or linseed oil should be used when rubbing down a shellac finish.

Essential 2. Dry Sandpaper

Sandpaper should be kept in a dry place and should be absolutely dry for using. If it is limp and does not crackle when bent, dry it until it does. Moisture softens the glue and the cutting material might come off and become embedded in the wood as the sandpaper is being used to sand a piece of wood.

Essential 3. An ability to recognize when to use finer sandpaper

The ability to know when to use a finer grade of sandpaper for sanding a piece of material comes after much work with sandpaper. A simple test is to rub a piece of No. 1 sandpaper across the grain of the wood; if it does not make much of a scratch, a finer sandpaper can be used to sand the piece of wood. If the wood is not sanded properly, when it is stained every scratch will become visible.

The reason some of the stained wood appears darker than others is because the wood has been sanded with a coarse paper, and the deep furrows thus caused, have not been cut down with a finer sandpaper. When a filler is then used on the wood, it fills these furrows and makes the surface appear darker than if the wood had been sanded with a finer grade of sandpaper, either to remove the furrows, or throughout the sanding process.

Essential 4. How to use sandpaper

Sandpaper should not be expected to do the work of the wood-cutting tools; also it is a poor policy to use sandpaper to cover the mistakes made by poor tool workmanship. Before starting to sand be sure that the wood has been well planed. Power planers leave

ripples on the surface of the board, and a scraper or smooth plane should be used to remove them as they do the work more rapidly and evenly than coarse sandpaper. Never use sandpaper to fit a joint. The sandpaper becomes embedded in the grain of the wood and if a plane is used afterward it will dull the cutting edge of the plane iron.

It is a fallacy to think that the finer the sandpaper used the better the job will be. It is as easy to spoil the surface of the board as it is to improve it, if poor work has been done. Do not depend upon the sandpaper to do most of the work in rubbing off the marks in the surface of the wood. The plane and scraper should do this work.

In finishing the wood by sanding, start the sanding on hardwoods with a No. 2 or 1½ sandpaper. On softer woods a No. 1 paper will do. It is important that the sanding is done in the direction of the grain, never across or even at the slightest angle with the grain. On a coarse job it is allowable to sand across the grain to cut the uneven places, but be sure to finish the surface by sanding in the direction of the grain of the wood. When the sandpaper is rubbed over the surface of the wood the sharp edges of the cutting material cut or comb down the fibers of the wood. Since the fibers of the wood run in a certain direction it is important that the sanding be done in the same direction.

Fold the sandpaper around the sanding block. Never tack it to the block because, not only will it be difficult to remove the sandpaper, but the tacks may scratch the wood surface, and thus prevent the full benefit of the sanding to be realized. It takes considerable muscular effort to rub out all the plane marks and rough spots on the board. Guard against rounding off the corners and destroying the form of the surface. Rub off raw corners to cut off the ragged edges. To give a true surface, the sandpapering must be done with an even pressure over the entire surface of the board. The pressure of the fingers against the sides of the block keep the paper tightly stretched on the block. Constantly change the position of the paper on the block to get the most out of the piece of sandpaper.

A slip on the board with a coarse piece of sandpaper will require a great deal of time to take out. It is better to take a little more time and use a finer grade of sandpaper. After the surfaces have been sanded, taking out the rough places on the board, go down the scale of grades of sandpaper to get a smooth glossy finish.

When preparing a surface for a water stain, sponge the surface to be stained with a clean damp cloth. This has a twofold purpose. First it cleans and removes the dust that has become lodged in the pores of the wood, and secondly it raises the loose fibers of the wood. It is better to raise the grain and remove these loose fibers before staining, rather than after staining. It is not necessary to sponge the surface of lumber that is to be stained with an oil or spirit stain.

When you have partially sanded a surface of the lumber, and for any reason must stop to start sanding again at a later time, do not apply new sandpaper of the same grade to the surface. You will undo all that the preceding sanding has done by cutting new deep furrows with the sharp abrasive. Use a finer grade of paper, or a piece of old or used paper of the same grade that has lost some of its cutting sharpness.

Aids in sanding different contours of wood surfaces.

Sanding flat surfaces.

Select the correct paper to start sanding.

Fold the sandpaper on the sand block, hold block flat on the surface of the wood, and sand with an even pressure with the grain of the wood.

Do not sand across the grain or in a circular motion on the wood.

Sanding edges and ends.

Using both hands to hold the sanding block, fingers touch both surfaces of the board to prevent the block from rocking.

In sanding end grain, sand in one direction only as this will prevent the paper from catching on the edge of the board and save the tearing of the sandpaper.

Sanding curves

In sanding convex curves or round corners use the sanding block.

Hold the block in both hands as in sanding end grain, and sand in one direction.

In sanding rounded edges or oval edges, hold the sandpaper in the palm of the hand. Do not use a sanding block.

In sanding concave or inside curves, place the sandpaper around a rod or rounded piece of wood and sand with the grain of the wood.

To use the sheet of sandpaper to its best advantage, fold it and tear it in half, then fold both halves and tear them, making four pieces of sandpaper out of one sheet of sandpaper.

MEASURING TEST

Kenneth Grinager,

Central Intermediate School,
Honolulu, T. H.

This teacher-testing aid is made of galvanized iron sheet metal for two reasons. It will last indefinitely and the answers when written on, may be washed off again.

It can be used in three different ways. For one exercise it can be measured from 0 to each one of the letters and the answer written on the metal at the side of each letter. For a second test, the student may be required to measure each space, the answers to be written in the spaces. The back can be used for other combinations to be measured for a third test.

For the third test, the reverse side of the test strip is used, and as the measurements for the various combinations are taken (from *S* to *U*, *M* to *T*, and so on) the results are written in the space between each pair of letters.

After each test, the metal strip can be washed off very easily with a little gasoline or turpentine.

Very accurate measurements can be scribed on the metal and very accurate measurements can be expected for answers.

This testing device has been found very useful since no paper is needed and the answer has to be accurate.

MAKING A SCREW DRIVER

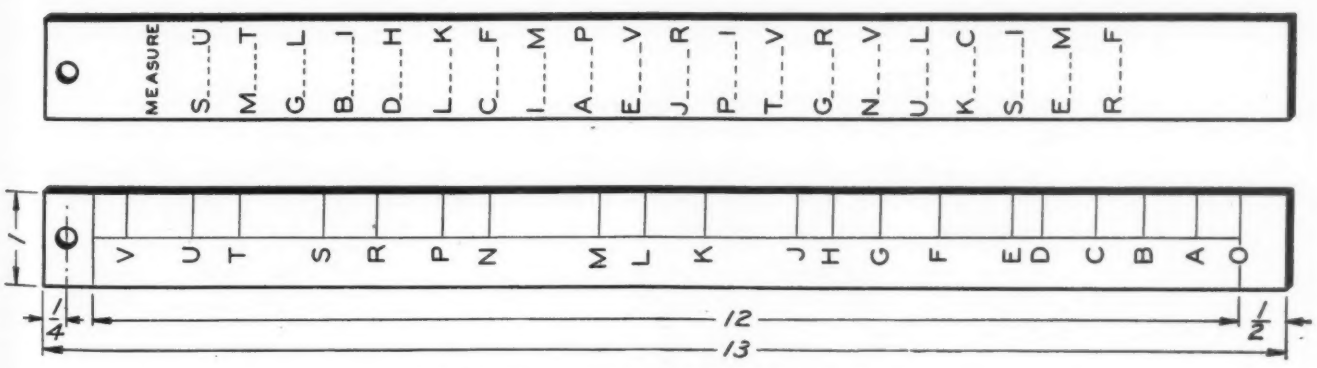
George C. Donson,

Washington, Pa.

The screw driver is a good general-shop project as it is not too difficult for the 9A students and yet not too easy for the more advanced boys in a higher grade. A local mechanic on a visit to our school said, "Every student in the shop should learn at least three things: first, how to use a hand hack saw without breaking the blade; second, how to use a file without beating its life out on the vise, and how to use it to produce a flat surface; and third, how to grind a screw driver."

In making the screw driver described herewith, the student has an opportunity to learn how to do all three of these things. He also can get an insight into how molds and chills are made for use in the foundry. The teacher will find the template shown in the illustration very helpful in checking the work of his students. This template is made of a piece of ¾-in. square steel about 4 in. long. Saw out the notch with a hack saw, making it a trifle smaller than it should be. Then heat the ¾-in. square piece to a dark red, and drive a properly shaped screw-driver bit into the notch, thus shaping it correctly for its future use as a gauge.

The making of the wood pattern may require some extra work, but when completed, it is good for many years. The one thing that



Front and reverse sides of sheet-metal test strip

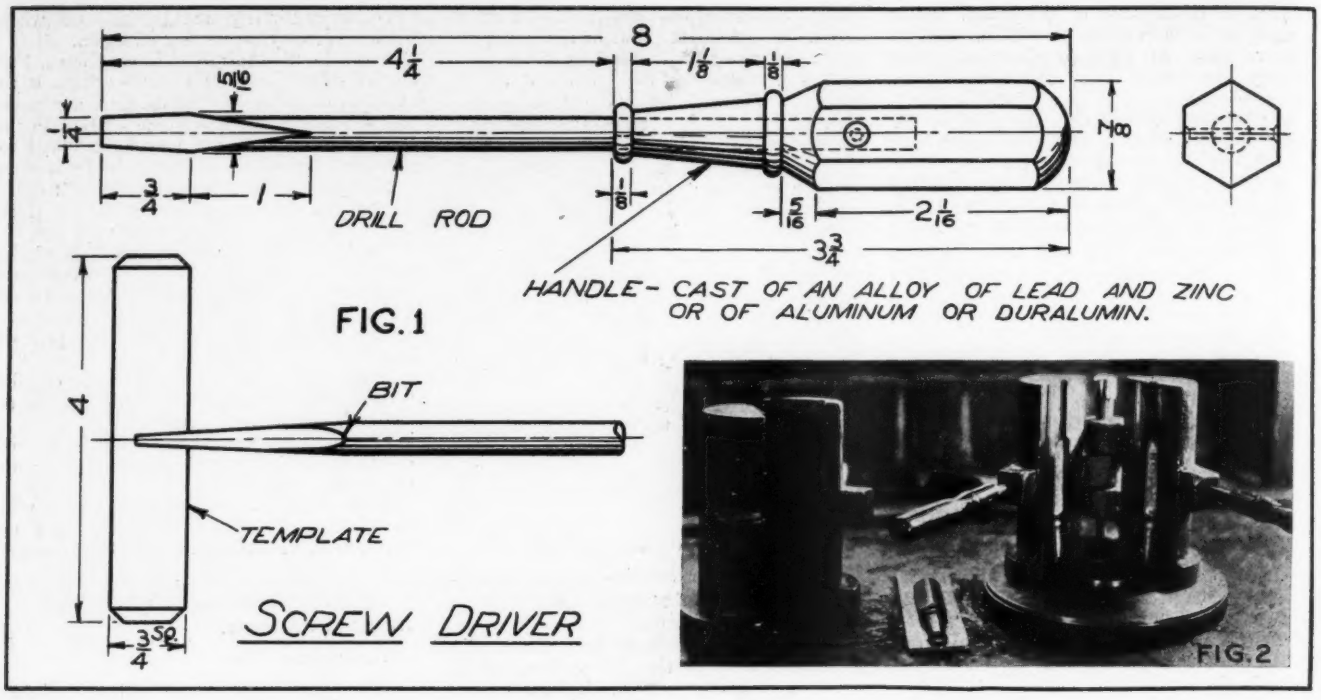


Fig. 1. Making a screw driver

may cause difficulty is the *chill* in which the screw-driver handles are cast. One half of the pattern for the handle is fastened to a piece of 1/16 by 2 by 6½-in. wood. Two castings of this in cast iron are then made and finished before molding. After the patterns for the mold are pulled, the chill is placed and the cast iron is poured over the cast-iron chills and this will give a fairly accurate form of the handle. If the molds are round, similar to the ones shown in the half tone, 1/16 in. should be allowed for filing or machining. The base for the mold may be solid or split. It must be bored for the 5/16 drill rod. If other sizes of drill rod are to be used, the same plate may be drilled for bushings to take the different sizes. For casting material for the handle we have used Zamack (a composition of lead and zinc), and aluminum and duralumin (Aluminum Company of America). These two latter metals take a nicer finish, and are not as heavy as the lead and zinc.

The screw-driver bit should be tempered so that it will be tough, but not brittle.

MINIATURE CHRISTMAS TREES

R. E. Murray,

Public Schools,
Fremont, Ohio

Prior to the holiday season, attractive, inexpensive, miniature Christmas trees may be made from discarded bowling pins.

The design has been so proportioned that the largest trees may be turned out of the pin with the least amount of waste.

Two pins are required to make a matching pair of trees.

The suggested scheme of decoration may be used as well as a number of others.

Pins may be obtained from any bowling alley at a slight cost. Quite frequently, no charge at all will be made for these discarded pins.

CHRISTMAS CARDS

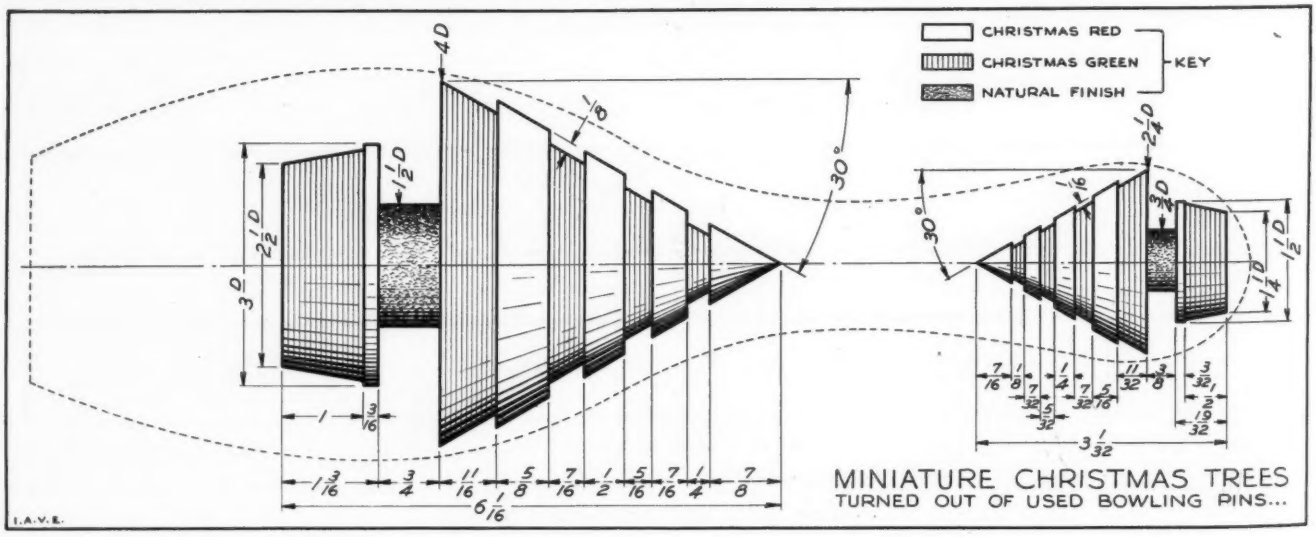
May Lillian Lampe,

Weehauken, N. J.

With Christmas in the offing, the question of cutting linoleum blocks for suitable Christmas cards may well deserve consideration.

In this period of world turmoil, hate, bloodshed, suspicion, greed, and oppression of the weak, it is soothing, to say the least, to think back to the day when the Prince of Peace was born. What better motif for a Christmas card then could one choose than the picture of the Christ Child and His Mother.

The linoleum-block designs shown herewith are fine examples of what can be done to



1. Madonna of the Chair by Raphael—(1512)—Royal Pitti Palace, Florence
2. The Madonna of the Grapes by Pierre Bignard—(1612-1695)—Louvre
3. A Madonna of Seville by Murillo—(1618–1682)—Royal Pitti Palace, Florence
4. Madonna and Child by Carlo Maratta—(1625–1713)—Dresden Gallery
5. The Madonna by Tieplo—Detroit Institute of Art
6. The Madonna by May Lillian Lampe—1941

make use of the beautiful Madonnas which the masters of the past have given us. Any one of these designs will make a Christmas greeting card that will make both sender and recipient happy.

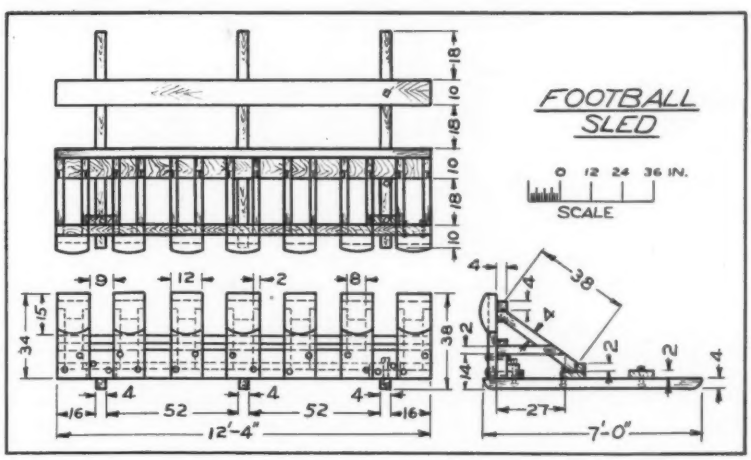
FOOTBALL CHARGING SLED AND HURDLES

Dean S. Bellman,

High School,
Albia, Iowa

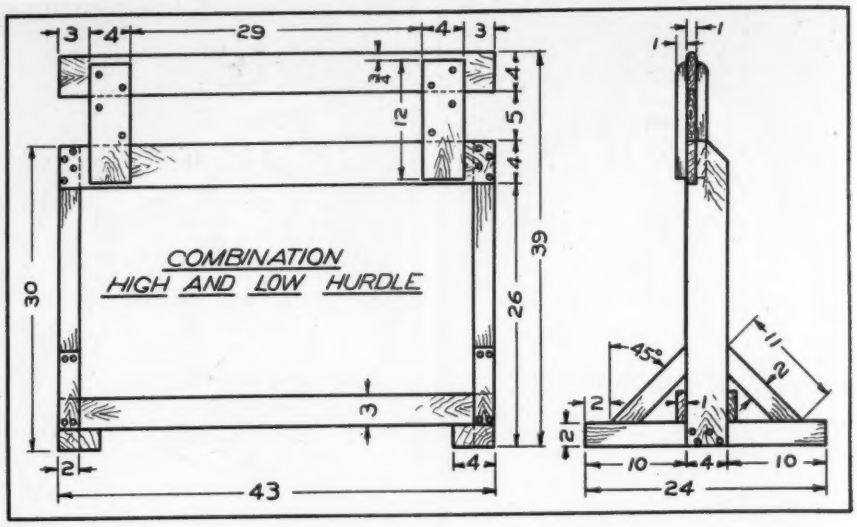
The football charging sled and the hurdles illustrated herewith have been in use for the past several years, and have proved to be very satisfactory.

The football charging sled was built almost entirely of 2-in. lumber discarded from bleachers. The project was built as a unit in the industrial-arts shop and then carried to the field and placed on the runners. The 4



by 4 by 84-in. runners may be removed so that the sled can be easily stored under the stadium until the next season.

The hurdles were made of 1 by 4-in. material exclusive of the feet and braces which were made of 2 by 4's. This type hurdle was built according to suggestions given by a former University of Iowa hurdler. The top section is removable thus forming a low hurdle.



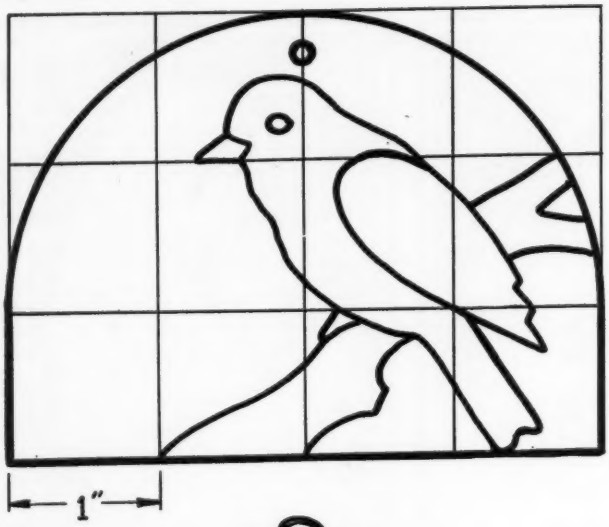
LITTLE CALENDARS

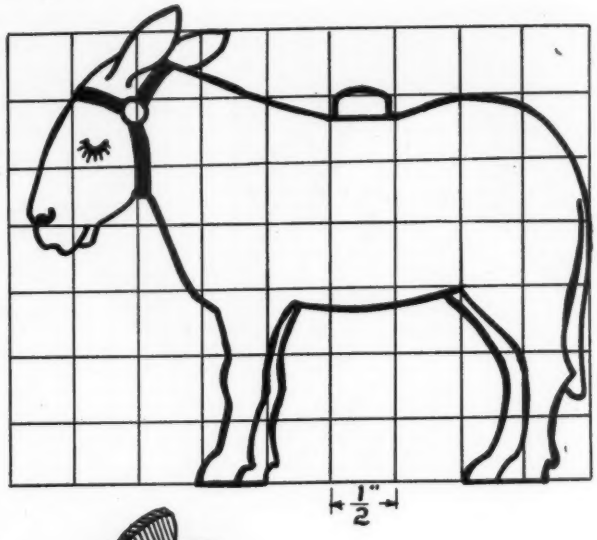
Hazel F. Showalter

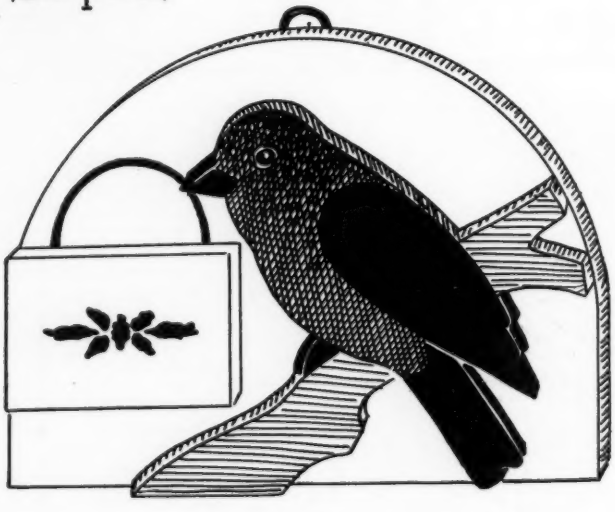
Davenport, Neb.

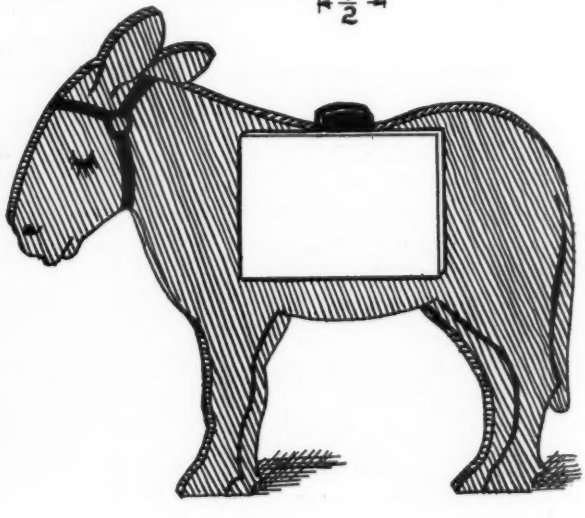
The making of little calendars is a pleasant supplementary occupation at this time of the year. Designs in the form of animals and birds carrying calendar pads have an especial appeal for the young worker. The calendar in the shape of a donkey is intended to stand on a desk, while the one with the bird design may be hung on a wall.

The pattern for the donkey is marked into









half-inch squares. It needs only to be cut from the wood, enameled brown, and finished with a few black marks. The calendar pad is glued to the side of the donkey as if it were a saddlebag.

The calendar with the bird design is made of two pieces, a 4-in. piece with a rounded top and a second piece in the form of a bird on a branch. The background is enameled a light sky blue, the branch brown, and the bird red with black trimmings. There is a black line to represent a hanger for the calendar pad. A metal hanger is attached to the back of the calendar and a calendar pad is glued in front of the bird.

Whittling-Jacknife Technique

W. BEN HUNT

Hales Corners, Wis.

(Continued from page 395 of the November, 1941, issue)

Last month's issue shows how some kinds of spirals are whittled. This month the whittling of several more kinds is described.

Figure 31 shows a rounded spiral which is just the opposite of those shown in Figures 24 and 25 which, one might say, are hollowed out.

Lay out the spiral, whether single or double, as shown in Figures 18 to 21, using a single line for the single twist or two lines for the double. Notice that the pitch of the spiral in Figure 31 is less than those shown in Figures 24 and 25. The pitch or slant, of course, is optional, but it also depends on what a given piece is to be used for or how much work the whittler wishes to undertake.

31

32

Start with a V cut as shown in Figure 32. This, probably, will have to be cut deeper with a second V cut, depending upon the size of the work. Then with smaller cuts round up the work nicely and if desired, finish with sandpaper.

Figure 31 shows a double spiral and should look, when finished, like two vines twisting around each other.

33

34

Figure 33 shows the Jacobean spiral. This is used a great deal in furniture and balasters.

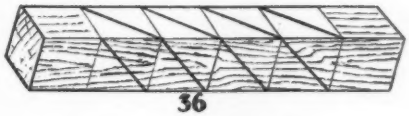
Lay out for a single spiral and start with a V cut as shown in Figure 34, going the full length of the part to be whittled. Then go over the whole groove with a deeper cut, as shown in Figure 34, being careful to keep an even depth. From then on, follow the directions that accompany Figures 24 and 32.

The twisted spirals should be carefully sanded to make a good job, but if they have been whittled neatly and carefully, they will look well even without sanding.

The *square spiral*, that is, a spiral cut from a square piece of wood, was used a great deal by the old Spanish settlers when lathes were not handy. Some of the work of these early pioneers can still be seen in the Southwest, and it is very attractive.

Figure 35 shows a finished piece of square spiral with a long pitch.

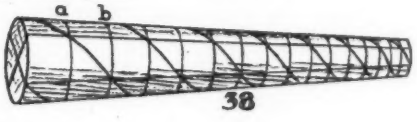
35



36

37

Lay out the square as shown in Figure 36. This shows less pitch than Figure 35 and is easier to whittle. After laying out, make V cuts on *all* the slant lines as shown in Figure 37. Follow with a second cut as shown at the right side of Figure 37, taking off the shoulder also. It will be noticed that the bottom points of the V cuts do not meet at the corners. To bring them in line, a smaller V cut must be made at a greater slant at the corners. After that, the finishing is practically like any other rounded spiral.



38

39

One more spiral that should be added to this series is a tapered spiral. Naturally if the stick is tapered the spiral, to be consistent, should taper also. In other words, the intervals of the spiral should get shorter as the smaller end of the stick is approached.

To lay out a tapered spiral, draw equally spaced lines lengthwise.

Then starting at the larger end, take ½ of the diameter at that point and draw the first crossline, *a*, that distance from the starting point as shown in Figure 38. Then measure the diameter at *a* and draw the next line, *b*, one half of that diameter from *a*, and continue this to the end of the spiral. This produces a good-looking spiral and one which may be laid out readily. The spirals are then laid out like any other, and, of course, the whittling is also the same, whether it be rounded, hollow, or open.

Figure 39 shows a hollow or concave tapered spiral.

CERAMIC PLASTERS FOR THE GENERAL SHOP

H. M. Van De Walker,

Southwestern Jr. High School,
Battle Creek, Mich.

The use of Keene's cement in the school shop has been tried by a number of industrial-arts instructors. Some of the attempts to use it have not been so successful because the material has some faults and the method of handling may introduce others. The castings made of Keene's cement are likely to be porous; they break very easily; the colors fade, and some of the finishes adhere but a short length of time.

When we communicated these faults to the United States Gypsum Co., they sent samples of various cements and plasters to the general shop of Southwestern Junior High School of Battle Creek, Mich., to be used experimentally in an effort to determine which type of material would be best suited for school use.

Among the ceramic plasters and cements sent, were three kinds of Keene's cement, Hydrocal, plaster of Paris, art plaster, molding plaster, and casting plaster. Used individually, none of these were found to fill the requirements completely.

Art molding and casting plasters are of the plaster of Paris family. Keene's cement, plaster of Paris, and Hydrocal are all made from the same basic material — calcium sulphate with two molecules of water of crystallization. Keene's cement is completely dehydrated, and chemicals are then added to cause it to set. Plaster of Paris has three quarters of the water driven off and nothing added, while Hydrocal is formed by cooking the calcium sulphate in a steel cylinder. This results in a uniform mixture and changes the crystalline form, giving Hydrocal the following advantages over the others: (*a*) greater strength; (*b*) greater density or hardness; and (*c*) it makes smoother castings.

Hydrocal, a new gypsum product, is used in the pottery, automobile, dental, and art industries where strength and hardness are desirable. The strength, hardness, and density can be controlled by varying the amount of mixing water used. A little less than one-half water per volume of plaster is the correct amount for castings poured in wood, metal, plaster, glue, or gelatine molds, but for sand molding enough water (about 50 per cent to the volume of plaster) must be used to obtain a medium thin creamy solution; otherwise, the casting will "cold shut" before the mold can be completely poured.

The experiment soon showed that a blending of white Hydrocal and art plaster made an ideal casting which dried to a hard smooth finish, was relatively free from pinholes, and could withstand hard usage. By varying the amount of art plaster mixed with the Hydrocal, the setting time could be controlled fairly easy. The more art plaster used, the slower the setting time and the softer the finished casting. The reason for this is that art plaster, which is made from the same basic rock as the Hydrocal, is manufactured in such a manner as to give it a slower setting time.

The coloring for the castings went through the same process of experimentation as the plasters. We finally settled upon the group of "Texolite Deep Colors" made by the United States Gypsum Co. A little of this color paste, completely dissolved in water and cut into the mixed plaster, will give a

permanent color. These color pigments may be purchased in ⅛-pt. tubes, ½-pt. glass jars, and in quart, 1-gal. and 5-gal. cans. The ½-pt. glass jars are best suited for school use. The tubes seem to develop holes, threads are stripped, caps lost, the paste dries out, and for that reason are not so useful in the school shop.

The uses of ceramic plasters in schools appear to be limited only to the instructors' desire to utilize them. Art instructors are finding the mixture of Hydrocal and art plaster better suited for their work than plaster of Paris, because the blending of the two cements gives a material which does not set so rapidly and can be carved and shaped more easily to the form desired. Linoleum blocks, carved and cast in the plasters, make fine desk pieces and give an incentive to the classwork. Solid cast blocks may be sculptured as easily as in clay.

Hydrocal and art plaster may be used to take the place of hot metal in teaching elementary molding. More advanced molding should be left for the advanced class in hot metalwork.

Students are encouraged to make their own patterns. The type constructed governs the method of molding, whether in sand, wood, or glue molds.

Wood molds are usually made by boxing in the pattern. They are subject to the usual wood troubles, shrinkage, warping, and expansion due to the moist cement being poured into them. Whenever they are used they should be solidly constructed and protected by sealing the entire surface with shellac, paint, or oil.

Gelatine or glue molds are used in making complex castings. The pattern is greased with linseed or lubricating oil and encased in a rough plaster backing in order to limit the thickness of the glue. When cool, the mold is cut along the natural parting lines of the pattern and carefully removed. The face of the mold is dusted and wiped with a thin solution of stearin and kerosene, or a thin solution of vaseline and kerosene. Each time the mold is used it must be dusted with chalk or talc to remove the kerosene grease. To harden the surface of the mold, a 10 to 20 per cent alum solution is brushed on and allowed to dry thoroughly. This renders the surface of the glue more resistant to evaporation. The glue may be used over and over by remelting as required.

White Hydrocal and art plaster, to be used in glue or gelatine molds, must be mixed somewhat thinner than when used in wood molds. After it is poured, the mold must be jarred so that the plaster gets into all of the crevices, and the air bubbles are all forced out. The casting is permitted to remain in the form until it has set hard enough to stand the removal. The removal setting point is determined by the temperature of the casting, as setting or crystallization generates heat. Do not hold castings in the glue mold after a temperature of 110-120 degrees F. has been reached; otherwise the glue melts and the mold is ruined.

The casting, when removed from the mold, contains a very great amount of water. This water will dry out if the casting is allowed to stand in the open air.

There are few rules governing the molding of ceramic plasters. These rules, when followed, will produce very acceptable castings.

Cleanliness in plaster casting cannot be overemphasized. Unclean mixing vessels with traces of previous usage will accelerate the setting time to a few minutes. This increase in setting time is due to seeding action of the gypsum crystals which contaminate the mix.

The most vital factor affecting the quality of plaster casting is the weight ratio between the plaster and water used in the mixing. The variations in the amount of water in relation to the weight of plaster affect the casting directly in strength, absorption, setting time, and internal structure. The more water used above the amount necessary to give a pourable mixture makes the casting that much softer and retards the setting time. Castings made in sand must have more water in the mix due to the rapid water extraction by the sand.

Control of the water-to-plaster ratio can be only positive when the amounts of water and plaster are measured.

To insure a dense hard casting free from air, which causes pinholes in the finished casting, sift the plaster into the water until a small island is formed above the surface of the water. Then let the batch stand from 2 to 5 min., before starting to mix. This permits the small particles of air to collect into bubbles of air large enough to be freed when hand mixing is started.

Any one or several of the "Texolite Deep Colors" dissolved in a few drops of water and cut into the creamy mix will produce a permanent color effect. One method of coloring imitation marble is to color threads and place them in the mold in a manner that will permit their later removal.

The mix should be poured gently into the forms, so as not to form air pockets. Then jar the mold so that all crevices are filled and that the entrapped air is permitted to escape from the mixture.

Castings should not be left in a mold longer than 24 hours, and even this is too long for castings. The under or enclosed parts of the casting retain much more moisture than the exposed surface and if the plaster is allowed to dry too slowly, it becomes softer and loses its strength. This softening is called *sweating or rotting*, and unless prevented will ruin the casting.

The semidried casting is best polished under water with a coarse and later a fine carborundum or pumice stone, using a circular polishing motion. The large rough spots or edges may be removed with a saw, plane, chisel, or any sharp woodworking tool without injury to the cutting edge.

The smoothed casting should be thoroughly dry before a finish is applied. The surface may be further hardened, before the varnish or lacquer coat, by painting with a thin solution of dextrine or gum arabic. The dried casting may then be painted and given any desired polychrome finish without fear of the paint peeling.

In reality, the industrial-arts instructor in this ceramic plasterwork is only producing scagliola (artificial stone), imitating marble, onyx, serpentine, and other decorative stones.

SIMPLIFYING TOOL CHECKING IN THE MACHINE SHOP

Henry C. Short,

Head of Machine Department, Mechanic Arts High School, Boston, Mass.

Unless some system of easily checking tools is instituted in school shops, much trouble is the result. Tools may become lost or misplaced, and the temptation for a boy to steal is strengthened. The instructor's time should be used just as far as possible for instruction purposes, and the boys' time for learning. It is not fair for either to be regularly "hunting" for mislaid equipment.

Neatness about a machine is usually the mark of a good workman. By assigning definite places for tools and attachments, and

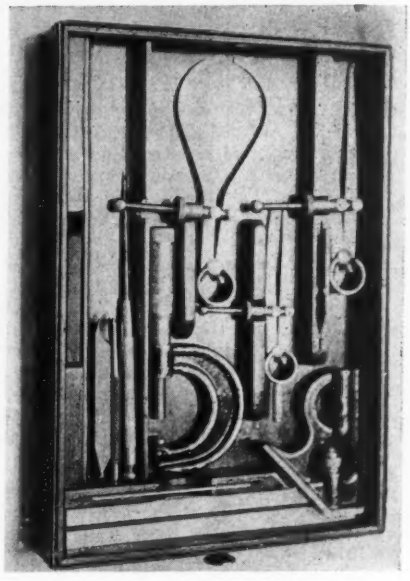


Fig. 1. Tool kit

returning them immediately after using, pupils are able to know just where to look for them when needed. It also is a very good teaching point. The time required to replace tools in this way is more than offset by the advantage of being able to readily find them again; besides, the tidiness of a machine materially adds to the appearance of a shop.

The Mechanic Arts High School, Boston, Mass., has an enrollment of more than 1600 students. In its machine department there

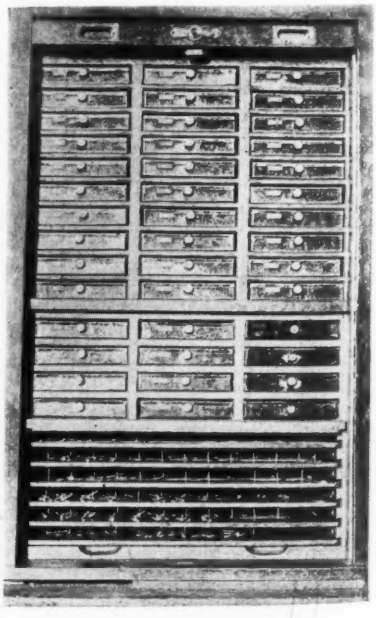


Fig. 2. Tool cabinet

are 60 or more engine lathes, 8 hand lathes, 4 bench lathes, 7 milling machines, 2 planers, 4 shapers, a turret lathe, a surface grinder, 2 cutter grinders, a radial drill, 4 heavy-duty drill presses, 5 sensitive drills, and other minor power machines. Each of these should have its own wrenches and equipment handy, so that the student has them at hand when he needs them.

Boys at the school take machine work in the course, for periods varying from 1½ to 3 hours.

Each boy obtains a tool kit containing the common shop tools that he will need from the toolroom keeper, by stating his number as he reports at the toolroom window. The kit contains a 1-in. micrometer caliper, a 3-in. steel rule, a 6-in. combination square and center gauge, a 4-in. outside spring caliper, a 4-in. inside spring caliper, a 3-in. spring divider, center punch, scriber, oilstone, and some 5/16-in. high-speed tool bits.

The tool kit is a 1⅛ by 6⅝ by 9⅜-in. metal box. It has a wood lining properly sectioned to fit each individual tool. A brass knob in front makes it easier to handle when the toolroom keeper puts it in or takes it out of the tool-kit cabinet. A brass number plate is fastened to the box with escutcheon pins. All tools in the compartments bear the same number as the kit of which they are a part. The toolroom keeper and the boy can easily inspect the kit with a glance to see that all tools are there, and the boy knows he is responsible for their safekeeping.

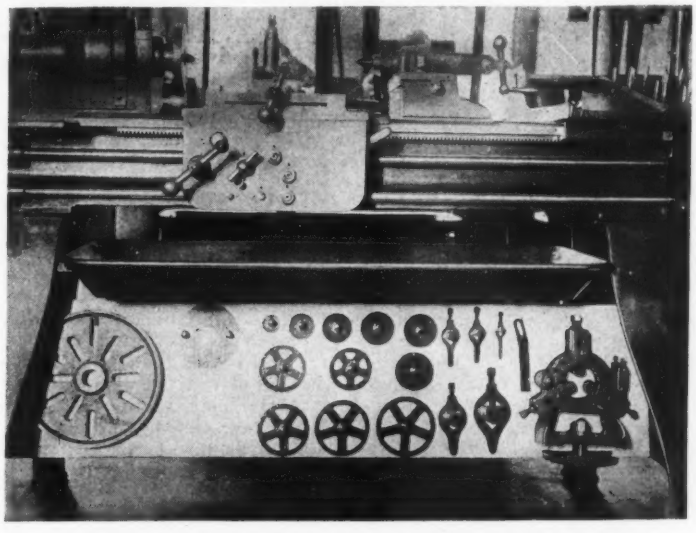


Fig. 3. Lathe board fastened to lathe under the pan

Figure 1 shows the tool kit issued to each boy, and Figure 2 shows the tool cabinet for storing kits and keyboards.

When working on a lathe, milling machine, planer, shaper, and the like, wrenches and equipment needed by the boy should be practically within reach of his hand.

The ordinary equipment used on each of our lathes consists of an 8-in. monkey wrench, chuck remover, cross-feed stop, Armstrong tool holder and wrench, tool-post wrench, tailstock wrench, large faceplate, backrest, 5 lathe dogs — ½ in., ¾ in., 1 in., 1½ in., 2 in.; a set of 9 change gears (for lathes not of geared-head type); blueprint holder, and tool-kit holder.

A board securely fastened to the lathe under the pan holds the faceplate, dogs, gears, and steady rest on pegs, as shown in Figure 3. Each article bears the number of the lathe on which it is to be used. A lathe board sliding on the ways of the lathe has a place for the tool kit, the blueprint, and the other equipment, as is shown in Figure 4. The tool-post wrench is always to be left on the tool-post screw, and the tailstock wrench on the tailstock.

The outline of each tool is shown black on an orange background on the boards, making it very easy for the boy or the instructor to check the equipment on each machine almost instantly.

The same procedure of numbering and of showing the form of the tool in solid black against an orange background is followed in regard to other machines. This permits the student to put in more time on the job he is doing, because less time is required to locate and check tools. Figure 5 shows a milling-machine board with arbors, wrenches, and the like.

At some machines, the boards are fastened to the bed; at others, to the wall close to the machine; while at still others, a pipe frame resting on flanges fastened to the floor supports the board.

Equipment such as taps, dies, reamers, drills, jigs, fixtures, and the like, is obtained in the regular manner from the toolroom, where it is recorded against a boy's number or by check.

Fig. 4. Lathe board sliding on ways of lathe

Fig. 5. Milling machine board

HOW TO MAKE A RELIEF MODEL

C. Frank Brockman,

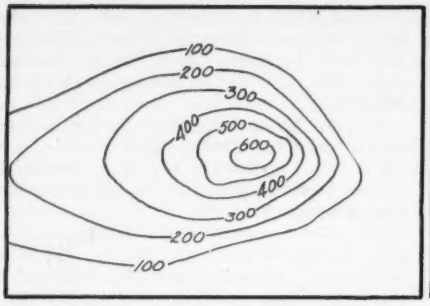
Mount Rainier National Park,
Longmire, Wash.

One of the most interesting objects to be found in any exhibit is a scale model of some bit of mother earth. Relief maps, as they are generally known, were quite common at the "Century of Progress" in Chicago and at the fairs in New York and San Francisco.

The value of these models, however, does not lie wholly in the mere satisfaction of public curiosity. The uses to which they may be put are almost endless. They help sell the geographical advantages of a region by presenting, in miniature, a replica of the actual terrain. By their use in the classroom or museum, the structural geology of the earth is explained better than by countless words. They may be used in industry in planning or illustrating extensive projects, and those whose efforts are concerned with national defense work may find them of value in visualizing actual engagements in time of war.

The great variety of uses to which these models may be put naturally results in considerable interest in the method of their preparation. Speculation as to the method of manufacture will generally develop from the comments of any group gathered about such a model. Furthermore, the examination of a relief model, together with an insight of the use to which it is being put, often generates a desire to construct one for a similar or related purpose. If the foregoing applies in your case, it is well to know that, while they appear complicated and difficult when completed and on display, they are essentially the product of a rather simple, though painstaking, procedure. The finest of such models are works of art in their faithful reproduction of minute detail, but most anyone can prepare a satisfactory and usable model by following a few simple rules.

While little artistic ability is necessary, the building of a relief model requires considerable hard work, careful application to detail, a lot of patience, and a lot of time. Anyone contemplating such a project should first



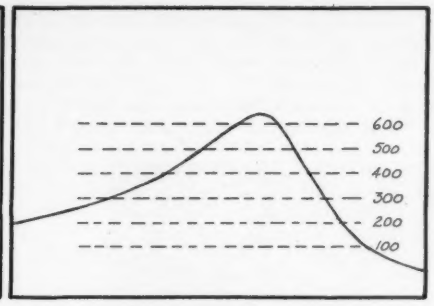


Fig. 1 left. Topographic map of a hill. The difference in elevation between any point on any 2 adjacent curves is 100 ft. Fig. 2 right. Cross section of the hill shown in Fig. 1

resign himself to those facts; otherwise the completed model — if it ever is completed — will not be satisfactory. The character of the finished product will also be largely determined by careful planning of all details, such as its size, horizontal scale and vertical scale, *before* a bit of material is purchased or a start on the actual work is made.

So whether you are interested in building such a model for use in some display, for use in the classroom, as a youth's handicraft project, or whether you are merely interested in the process by which they are prepared, here is the method of procedure.

1. A good topographic map of the region to be modeled is the first necessity. This map with its numerous wavy lines, known as contour lines, serves as a picture of the region's topography. Each contour line represents points of equal elevation. Where these lines are far apart, a gradual slope is indicated; where they are close together a steep slope would be found. Figures 1 and 2 illustrate the principle of the topographic or contour map. The vertical distance between each contour is 100 ft. This is known as the contour interval.

As shown in Figure 1, there is a gradual slope on the left and a steeper slope on the right, for the contour lines are closer together in the latter case. In Figure 2 is shown a cross section of this hill, the dotted lines indicating the position of the contours which appear on the mapped area in Figure 1.

Fig. 4. Cardboard foundation in the process of development. The worker is laying on a thickness of cardboard, recently traced and cut. Note the step-like character of the foundation. (Photo courtesy of the Western Museum Laboratories, National Park Service.)

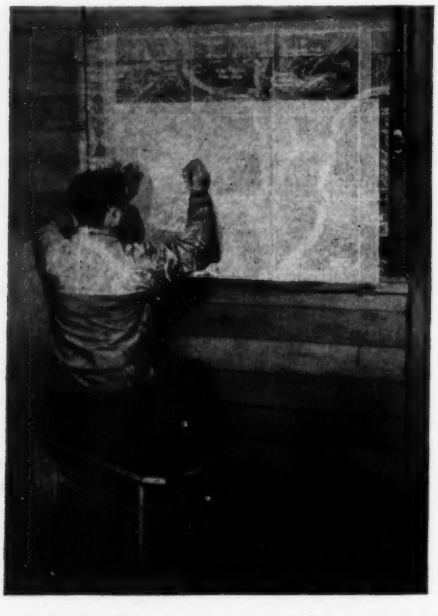


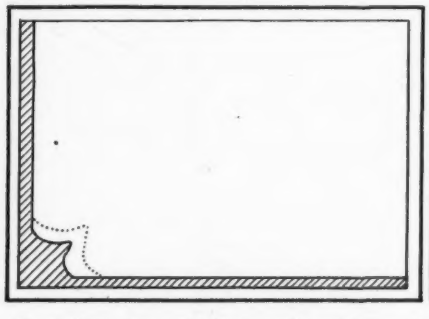
Fig. 3. Tracing contours on cardboard. Note projected image of contour map on the wall. This image is projected from a slide in a steriopticon lantern. (Photo courtesy of Western Museum Laboratories, National Park Service.)

2. The foundation of the model is built up of layers of cardboard, the thickness of each layer representing the contour interval of the map. The wavy pattern of each contour is first traced upon a sheet of cardboard of the proper thickness. These are then cut out and placed upon those that have gone before and tacked or glued in position. This procedure is continued until the entire foundation is completed.

In order to simplify this description, we will assume that the desired model is to be of a size identical to that of your map. However, if the finished model is to be larger than the map, lantern slides of the latter will first have to be made. These lantern slides serve in projecting the map upon some flat, rigid surface to the desired size by means of a stereopticon lantern, following which, the contours are traced as already noted. See Figure 3. In enlarging maps by means of projection, the preparator must make sure that his stereopticon, and the table upon which it stands, are firmly fixed in place. Even a slight movement of either will throw everything out of adjustment and it will be practically impossible to re-establish the equipment in an identical position. So be sure that the lantern is screwed, or bolted, to the table, that the table is securely fastened to the floor, and that the surface upon which the image is to be projected is rigid and stationary.

Because each layer of cardboard indicates the map's contour interval, the vertical scale of the model must be given careful consideration for it determines the thickness of the layers to be used. If the layer is too thick, the hills will be too high and the valleys too narrow; if it is too thin the reverse will be true. One may compute the thickness of the layers necessary by dividing the horizontal scale of the map by the contour interval. For instance, if 1 in. equals 1000 ft. on the map which is being used, and the contour interval is 25 ft., the layer to be used should be one fortieth of an inch thick. If the contour interval is 50 ft., the thickness of the layer should be one twentieth of an inch. See Figure 4. By using cardboard of the thickness indicated by such computations, a model will be constructed in which the horizontal and vertical scale are the same. In other words the topography of the finished model will be an exact miniature of the actual area. However, many relief models have the vertical scale exaggerated. This is particularly true of those depicting some comparatively flat region where topographic differences are not of an abrupt enough character to make them stand out in the miniature replica. Exaggeration of the vertical scale in such a case may be justified, for then the hills and the valleys of the model appear more nearly as they actually are, when viewed from the ground level. For areas of rugged topography, it is not necessary to exaggerate the vertical scale. In fact the tendency today is to make the vertical and horizontal scale the same, regardless of the nature of the relief of the area in question.

3. In starting the foundation, first locate the contour of lowest elevation on your map. This should be traced upon the first sheet of cardboard and the resultant pattern should be cut out and placed upon a suitable base.



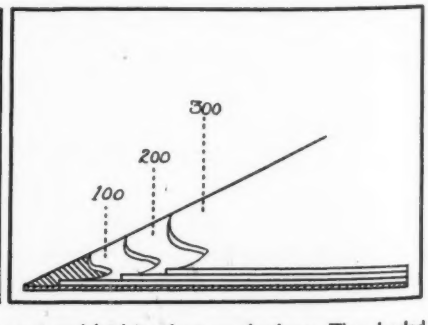


Fig. 5 left, shows the first cardboard layer cut out and laid in place on the base. The shaded portion is the base. The dotted line represents the outline of the next layer. Fig. 6 right. Side view of Fig. 5 except that the 2nd and 3rd layers are in place

The first cutout will usually follow the border of the map with the exception of a small notch, or notches, along the edge, the lowest portion of any area being generally along its boundaries. In Figure 5 the shaded portion indicates the base of the foundation and the heavy line indicates a portion of the lowest contour which has been traced, cut out, and glued or tacked to the base. The dotted line represents a portion of the next highest contour which should be sketched in to serve as a guide in placing the next thickness of cardboard. Figure 6 is a side view of the same, except that it shows the second and third thicknesses of cardboard in place.

Cutting is done with a jig saw, cut awl, or some similar instrument capable of doing accurate work. As each contour is traced, cut out, and laid on, the foundation will gradually develop. As the work progresses the original large cutout will give way to smaller units, as the different hills and valleys take form. When the foundation is complete, as shown in Figure 5, it will be composed of cardboard terraces which are, in reality, the contour intervals of the earth, as indicated by the topographic map.

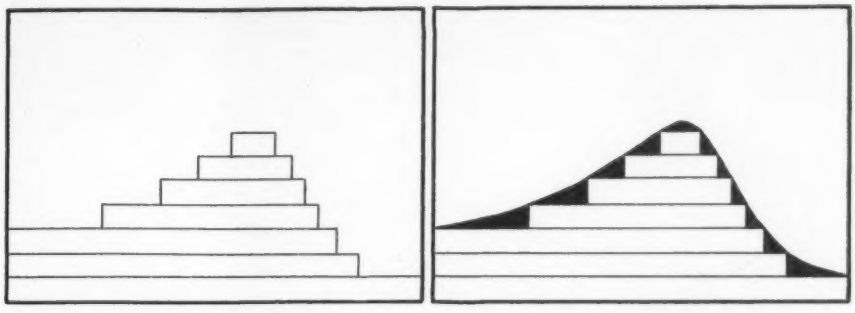


Fig. 7 left. Completed cardboard foundation. Each thickness represents the contour interval to scale. This sketch shows how the hill, shown in Figs. 1 and 2, was built up. Fig. 8 right. Method of applying plastic clay to the cardboard foundation

Fig. 9. The cardboard foundation completed and the work of modeling with plastic clay going on. (Photo courtesy of Western Museum Laboratories, National Park Service.)

4. Following the completion of the cardboard foundation, plastic clay is worked into the terraces until the step-like effect is obliterated. This should be done very carefully for the artistic merit of the model depends largely upon this operation. With the fingers or modeling tools, apply the clay just thick enough to cover the corners of the layers as noted in Figures 7 and 8. If possible, work in all minor topographic details not indicated by the map, using good photos as guides in this process. When the model is as faithful a presentation of the area as possible, it is ready for being cast in plaster of Paris. See Figure 9.

5. First a *negative*, an upside down replica of the model which will serve as the mold for future *positives*, is cast. Before making a cast, however, it is wise to experiment with plaster of Paris by casting small objects, such as irregular gobs of plastic clay, until the beginner gets the *feel* of how the plaster reacts in this process. When ready to undertake the casting of the model, grease or soap (lather it as for shaving) the original clay replica to prevent the paster mold from sticking to the clay when the two are to be separated. The sides of the model are, of course, first walled with cardboard or plastic clay as shown in Figure 10. This is done to hold the plaster in place while it is still in liquid form. The plaster should be mixed in small quantities as needed. Sift the plaster slowly into a bucket of water, stirring gently, until the plaster does not readily dissolve upon the surface of the liquid. When this occurs the mixture will have the consistency of thin soup. Ladel this on the model carefully so that a thin layer covers the entire surface. Now quickly dip strips and squares of coarse burlap into the bucket of liquid plaster — these strips and squares should be provided in advance and placed in a convenient location — and lay them, dripping, upon the model. The plaster in them will merge with that of the thin layer already applied and, as they are placed so that they overlap, will give strength to the cast when it hardens. This process is continued until the negative cast is of sufficient thickness; this, of course, being dependent upon the size of the model. In large models it may also be necessary to reinforce the plaster cast with wooden or metal rods which are set in the plaster before it hardens and anchored in place with strips of plaster-soaked burlap. When the entire surface has been covered to the desired thickness, the negative is allowed to harden.

6. When the plaster is hard, the temporary sides of the model are removed and the plaster cast is gently pulled and lifted about the edges. This is continued until the cast begins to show signs of pulling away from the original clay model. If it is properly handled, and if it has been well reinforced with burlap in the casting process, there should be no danger of its cracking in this operation.

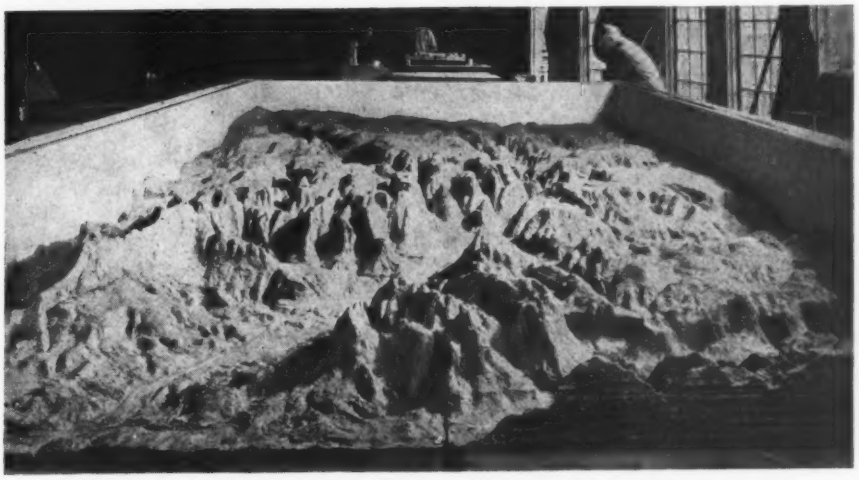


Fig. 10. A large relief map with the clay modeling completed and ready for casting of the negative. (Photo courtesy of the Western Museum Division, National Park Service.)

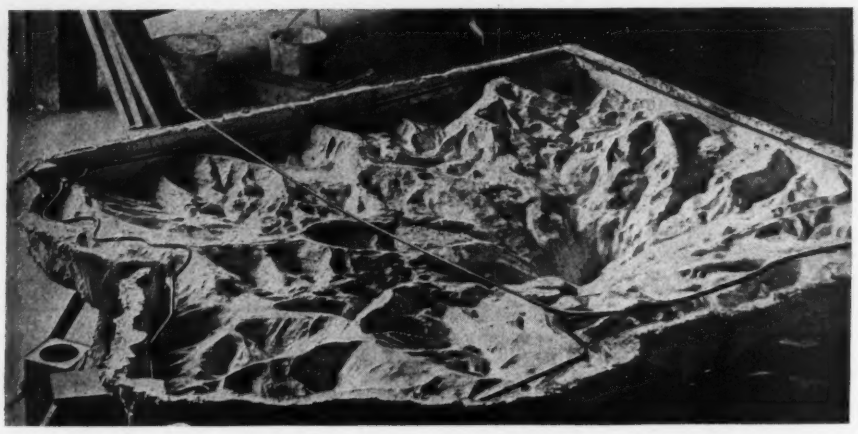


Fig. 11. The negative cast set up and ready for casting the positive. Note the iron rod which has been set along the model's inside edge; this will serve as a reinforcement. The negative pictured here is the one from which the completed model of Mount Rainier National Park was made

Eventually the entire cast will separate from the clay model. It should then be set aside to dry and, while drying, the entire surface should be carefully examined so that any defects that might be present can be eliminated. When thoroughly dry the newly made mold should be given several coats of shellac. See Figure 11. When the shellac is dry the mold may be used in casting the *positive*.

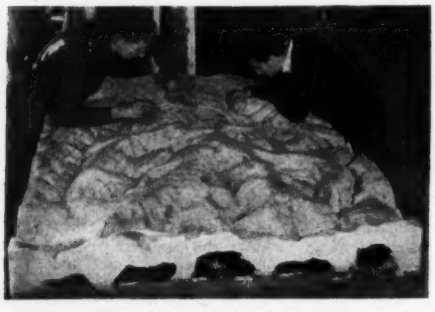


Fig. 12. The positive model, just after casting from the negative, in the process of being touched up and made ready for painting. (Photo courtesy of the Western Museum Laboratories, National Park Service.)

Fig. 13. A relief model in the final stage—that of painting. (Photo courtesy of the Western Museum Laboratories, National Park Service.)

7. Casting the positive is quite similar to the process of casting the negative. Essentially the same procedure is followed. The negative is first soaped. Then a thin layer of plaster is carefully ladeled over the surface of the mold. This operation is followed by the addition of several layers of plaster-soaked burlap. When the positive is of a satisfactory thickness, it is allowed to harden and when ready, mold and plaster model are separated. See Figure 12. Both units are then touched up, for a certain number of minor defects can be expected after each casting. Also both the negative and the positive are given several coats of shellac.

If the negative has been properly made and if it is properly handled, any number of positives may be made from it. It is also well to know that, while small models are cast in one piece, larger relief maps offer a more complex problem and usually require casting in sections; these being fitted together, as in a jig-saw puzzle, in the completed job.

8. The last step, and in some respects the most important, is the decoration of the model. Timbered areas, barren sections, roads, trails, and similar features are indicated by variously colored oil paints. When this is done the model is complete and, save for a few coats of shellac to preserve the finish from excessive wear in handling, is ready for display. See Figures 13 and 14.

WORN TABLE—FEUDAL OAK FINISH

C. Forrest Felix,

Johnstown, Pa.

This table is made of oak and when finished makes a fine piece of antique furniture.

The drawing is very complete as to shape and sizes. One of the fine features of this table is that it is assembled with screws, and can be taken apart at any time if needed.

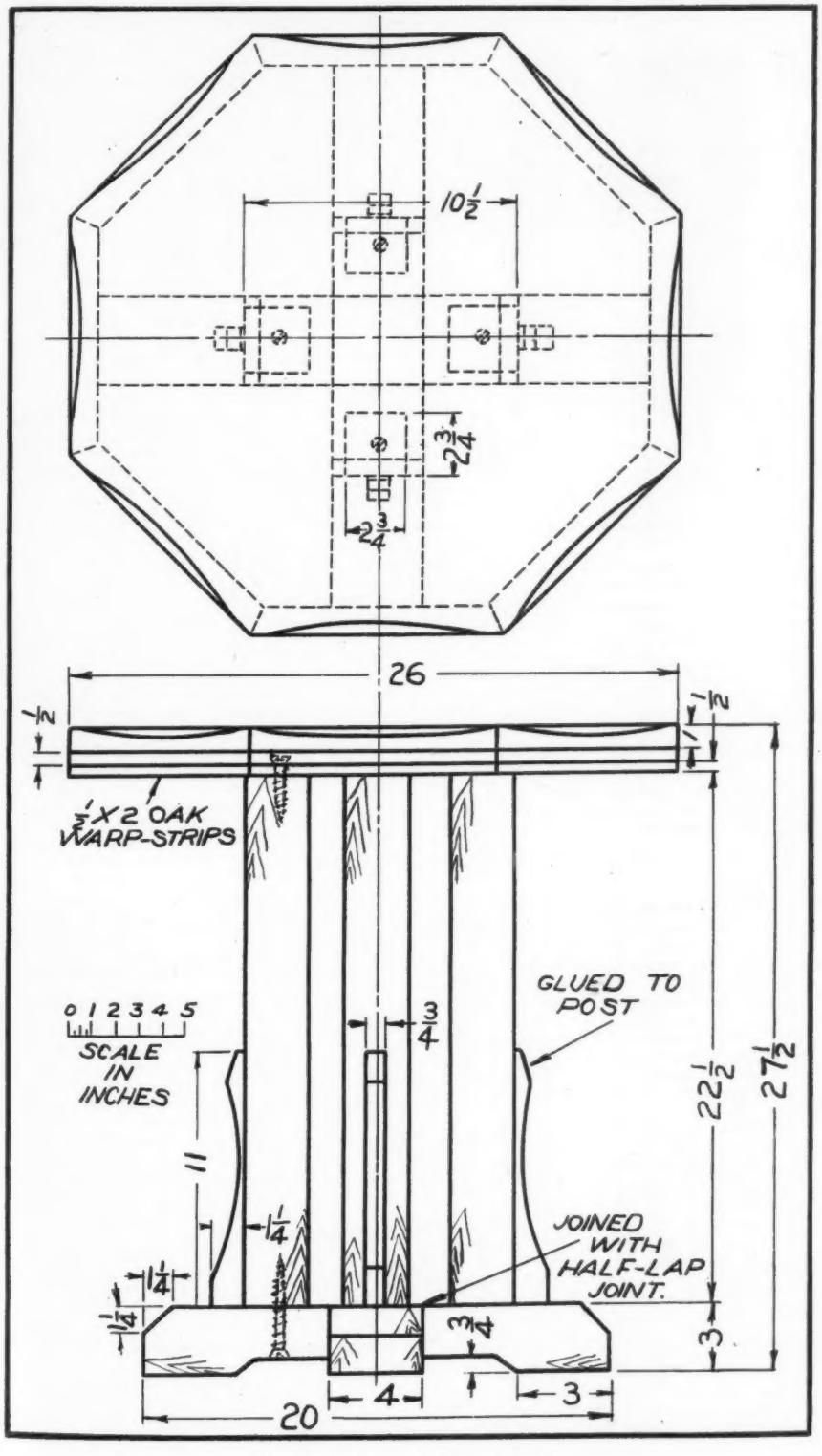
The finish is an antique idea. First stain medium dark mission oak with an oil. Let dry 24 hours. Then coat with a dull varnish which must be allowed to dry thoroughly. Mix white lead and turpentine to the thickness of

Worn oak table — feudal oak finish

Fig. 14. A completed model (Mount Rainier National Park) on display

cream, and apply it to one piece at a time. Work the mixture into the grain and then wipe off clean at once across the grain. After this has dried, apply a coat of dull or satin finish varnish, and again allow the coat to dry, and then wax.

The table is very easily made. The feet and warp pieces at the top of the legs are made with lap joints. Butt joints are made at the top and bottom of the legs. This table makes a very good project for the junior high school boy.



Worn oak table — feudal oak finish

ANSWERS TO QUESTIONS

WATER STAIN CHEMICALS?

1078. Q.: We are looking for some chemical or dye with which we can replace some German chemicals which we have used for water stain. We haven't found anything to match these so far, and we would like to know if you have any suggestions as to where we might look for them. The chemicals we now use are mixed with water and applied that way, and we believe that a stain of this type is necessary. — *E. P. F.*

A.: Try the City Chemical Corp., 132 West 22nd St., New York, N. Y. They are ready to furnish an ounce or a carload. — *Ralph Waring.*

FINISHING MAPLE SALAD PLATES

1079. Q.: One of my students made a set of salad plates of maple. What kind of finish can we use that will not cause the food to taste and yet preserve and give a nice finish to the plates? — *L. H. W.*

A.: Salad plates in maple can be finished in a light Honey, Amber, or New England Maple to bring out the natural grain under a water stain. One of the two of the following newer methods may be used.

1. Apply one or more sprayed coats of wood lacquer as made by a reputable company. The coats may be sanded between applications if necessary, using at least 6/0 garnet paper or No. 320 paper. The last coat should be cut down clean and even by making up a pad of No. 2/0 steel wool and loading with floor wax. Use this to bring up a fine true surface, let the coat of adherent wax dry an hour after rubbing, and then buff with a rag wheel at about 2400 r.p.m. or by rubbing with a rag or carpet pad. Such a finish can be used with all classes of foods, washed clean with soap and water, then rewaxed and polished as circumstances require.

2. Apply the water stain, and after that is dry, follow with one of the newer penetrating wood finishes as sold by DuPont or Sherwin-Williams Co. for floor treatments. Simply follow the directions on the cans of the product being used. A most beautiful and extremely durable finish will be the result. — *Ralph Waring.*

NEW PUBLICATIONS

Bent Tubular Furniture

By Chris H. Groneman. Cloth, 112 pages. 6¼ by 9⅜ in., illustrated. Price, $2.25. Published by The Bruce Publishing Co., Milwaukee, Wis.

This book contains 51 very interesting bent tubular projects. These are all comparatively easy to make and they have been so designed that they can be made with the least number of special tools.

The bending jigs can be readily made either by the homecraftsman or in the school shop. The joints of the tubular constructions may be welded, but specific directions are given for making them by means other than welding.

A working drawing, a perspective sketch, and a bill of materials accompanies each one of the projects.

Mechanics — Industrial Physics

By L. Raymond Smith. Cloth, 229 pages. 5 by 7⅝ in., illustrated. Price, $1.75. Published by the McGraw-Hill Book Co., New York, N. Y.

A revised edition in elementary practical mechanics.

The definitions and descriptions are given in plain understandable terms, and they are accompanied by illustrative examples and numerous applied problems.

The 22 chapters include measurements, gravitation, force, motion, composition and resolution of forces and velocities, equilibrium of forces, a study of structures, elasticity, work, power, energy, friction, simple machines, transmission

of power, fluids, falling bodies, centrifugal force, and the pendulum. Some useful tables have also been added.

Machine Tool Operation Part I

By Henry D. Burghardt. Cloth, 420 pages. 5 by 7½ in., illustrated. Price, $2.25. Published by the McGraw-Hill Book Co., New York, N. Y.

This is the third edition of this well-known text on machine-shop practice. In it are given lucid explanations about many trade terms. There are also clear-cut directions on how to run the power lathe, how to choose and sharpen the cutting tools used on the lathe, how to use the various measuring tools, how to do the various types of operations on the lathe, how to do the layout work met with in what is known as benchwork, how to use the various hand tools commonly used by the benchworker, and how to do soldering, brazing, babbitting, hardening and tempering, and hand forging.

Flight — First Principles

By Capt. Bailey Wright, James J. Smiley, Jr., and Rex Martin. Cloth, 6¼ by 9⅜ in., 283 pages, illustrated. Price, $2.50. Published by American Technical Society, Chicago, Ill.

This book presents in easily understood language a short historical sketch of transportation as a business, a glossary of terms for the beginner, a well-illustrated explanation of the theory of flight, and the principles of aerodynamics.

The book also contains a chapter on soaring and one on parachutes.

Blueprint Reading for the Machine Trades

By John J. Weir. Cloth, 8½ by 11 in., 82 pages, illustrated. Price, $1. Published by McGraw-Hill Book Co., New York, N. Y.

This course was devised especially for those who are engaged in or are preparing to enter the metal trades. The material is divided into 15 lessons, in each of which question work in the form of sketching problems and blueprint reading problems of various kinds, are provided.

Electricity in the Home and on the Farm

By Forrest B. Wright. Cloth, 372 pages. 5⅝ by 8¼ in., illustrated. Price, $2.75. Published by John Wiley and Sons, Inc., London.

This is the second edition of this book which has been written to serve as a text in the school shop and as a helpful guide for the houseowner and farmer.

The book is divided into two parts, the first of which contains job sheets describing how to make, test, and study the operation of common electrical appliances; and the second of which discusses the theoretical aspects and applications of electricity and magnetism.

Farm Buildings

By John C. Wooley. Cloth, 345 pages. Price, $3. McGraw-Hill Book Co., New York, N. Y.

This comprehensive book is written from the standpoint of the practical farmer and farm economist, and provides in detail the information needed for solving the problems of planning, constructing, and maintenance of farm structures. Materials, structural design, and the sanitation and safety problems of construction are fully discussed. For college use as a text, the author has provided separate chapters on farmhome planning, the drafting of plans, and laboratory exercises.

PERSONAL NEWS

APPOINTED CHAIRMAN OF THE DIVISION OF ARTS

Dr. Kenneth F. Perry, whose appearances on the programs of the American Vocational Association in Grand Rapids and San Francisco attracted attention to him as an outstanding leader and teacher in his field, has just been appointed chairman of the Division of Arts at Colorado State College of Education at Greeley, Colo. He succeeds Miss Grace M. Baker, retired.

Dr. Perry has been a member of the faculty of the Division of the Arts in the college at Greeley for the past 14 years. The division includes departments in fine, industrial, and home arts. In industrial arts, courses are offered in woodworking, drafting, metalwork, printing, bookbinding, leathercraft, design, and the other related areas. Work is offered in both undergraduate and graduate levels leading to the B.A. and M.A. degrees.

Dr. Kenneth F. Perry

In addition to the large enrollment in the regular college year, Dr. Perry's division had more than a hundred graduate students enrolled the past summer.

Dr. Perry was raised in Fort Lupton, Colo., where his father was engaged in business for a number of years. He received both his B.A. and M.A. degrees at Colorado State College of Education, and completed work on his doctorate at Teachers College, Columbia University, in June, 1941. His dissertation "An Experiment With a Diversified Arts Program," will be published by the Bureau of Publications of Teachers College late this year.

Before going to Greeley, Dr. Perry taught industrial arts at Riverside High School, Fort Worth, Tex., and at Grant Junior High School, Denver, Colo. He is a member of the American Vocational Association.

CLAUDE H. EWING PROMOTED

The expansion of vocational education caused by the National Defense Training Program has resulted in many men changing positions and in the promotion of others. Chicago's vocational program under the direction of Dr. William H. Johnson, superintendent of schools, and Mr. Philip L. McNamee, assistant superintendent, has been extended by the addition of a curriculum department at the Washburne Trade School with a staff of three draftsmen, two technical writers, and four stenographers. This department has been placed under the supervision of Claude H. Ewing.

Among the accomplishments of this department has been the establishment of a technical library at the Washburne Trade School and the selection of the books for the Chicago Vocational School library.

In addition to the supervision of curriculum in the day and evening school at Washburne, Mr. Ewing is conducting a seminar for graduate students from the Chicago Teachers' College who are carrying on shopwork in the Washburne Evening Trade School, and also lecturing at Loyola University in the graduate division of the department of education.

The programs of the Chicago Teachers' College and Loyola University offer a master's degree with a major in industrial education. Both of these programs have been developed to meet the need for better qualified instructors in the field of industrial education.

LEE ARDUSER AT UNIVERSITY OF ALABAMA

Lee P. Arduser, who is well known to thousands of teachers in the fields of industrial arts and vocational education, is now executive assistant, National Defense Council, University of Alabama, University, Ala.

Mr. Arduser graduated from the Dubuque High School in 1915, spent several years in the automobile industry, and was second lieutenant of field artillery in World War I.

In 1920 he received the B.S. degree in mechanical engineering, and in 1923 the M.S. degree from Iowa State College.

From 1920 to 1925 he was instructor and assistant professor in the department of trades and industry and industrial arts at Iowa State College.

In 1925 he accepted a position on the staff of John Wiley and Sons, Inc., and remained with this firm until he became assistant director, educational department, Brooklyn Central Y.M.C.A. He held this position until 1931 when he joined the International Textbook Co. He remained with this firm until he took up his administrative duties at the University of Alabama.

His many friends wish him "Good Luck."

♦ L. H. Dennis, executive secretary of the American Vocational Association, has been appointed as a special consultant to the Secretary of War. As a result of this appointment, his advice and assistance will have much weight with commanding officers and morale officers of the United States Army.

♦ Dr. F. Theodore Struck, of The Pennsylvania State College, addressed teachers of industrial arts and vocational education at a meeting of the New Hampshire Education Association at Nashua, N. H., on October 23, 1941.

♦ Ralph Nair, of Kansas City, Mo., has been added to the faculty of the Industrial-Education Division of the Santa Barbara State College, Santa Barbara, Calif.

Mr. Nair received his baccalaureate and his master's degree in education in the Kansas State College, Pittsburg, Kans. His teaching experience includes a period of time in smaller community schools before his employment in Kansas City. At various times he has been a member of the summer session staff of the Colorado State College, at Fort Collins, and the University of Nebraska. At Santa Barbara he was teaching benchwork in wood and industrial arts for elementary schools.

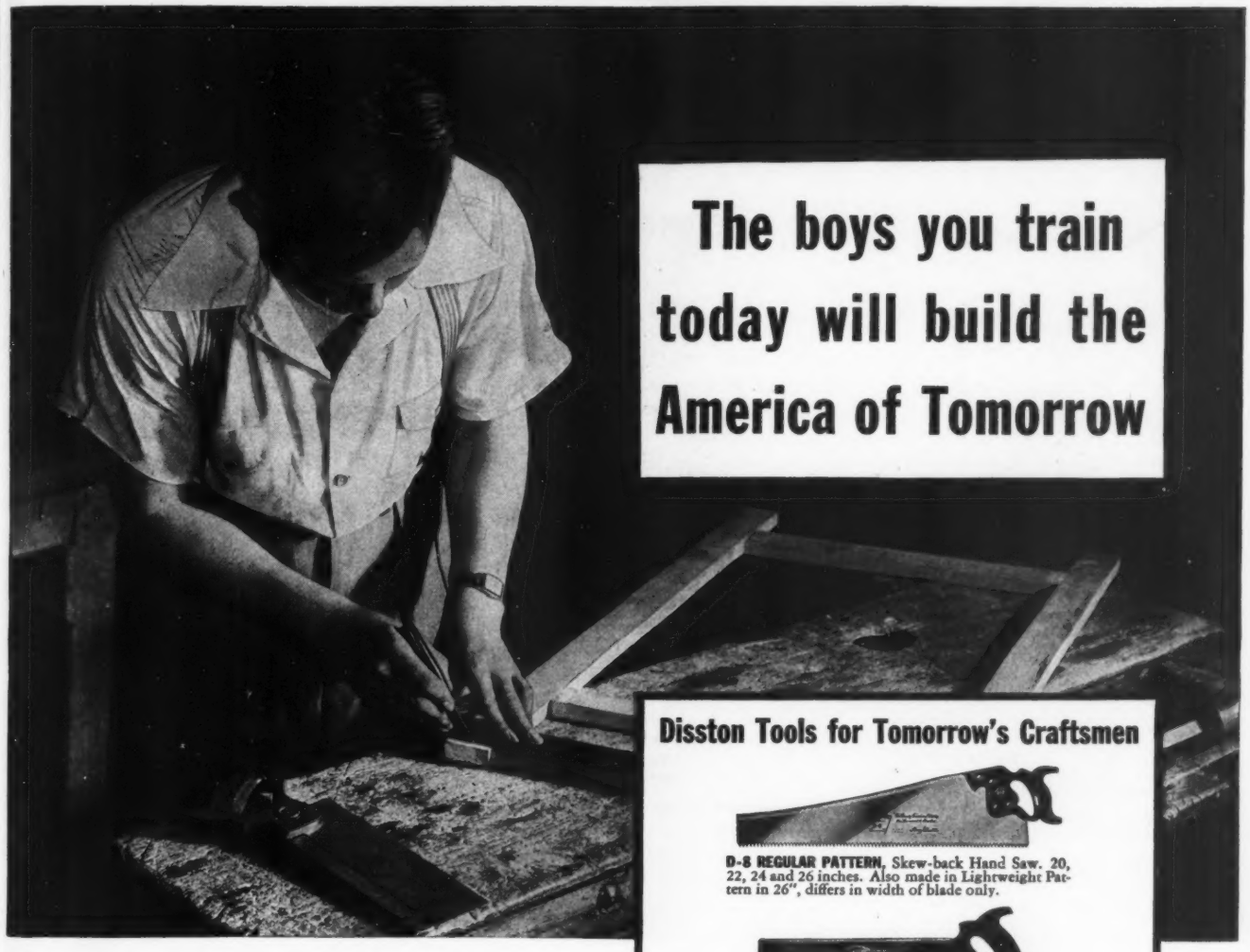
♦ Francisco C. Urgell, industrial teacher trainer of the University of Puerto Rico, completed all requirements for the degree of doctor of philosophy with a major in industrial education at The Pennsylvania State College. Dr. Urgell has had extensive experience including 3 years as rural teacher, 4 years as elementary school teacher, 10 years as teacher of industrial arts in high schools, and 2 years as a director of an industrial school. He also served for 8 years as supervisor of industrial arts for the Island of Puerto Rico and 2 years as teacher trainer. Dr. Urgell's dissertation is entitled, "The Development and Contemporary Problems of Vocational Education in Puerto Rico." In his dissertation, Dr. Urgell has dealt comprehensively with the development of vocational education of all types in the island from earliest times onward, and has made certain recommendations for the improvement of the program.

♦ Stanley J. Pawelek, acting supervisor of industrial and trade education, received the doctoral degree at the end of the last summer session.

♦ Warren G. Meyer has been appointed assistant supervisor of Distributive Education for the state of Kansas.

Mr. Meyer was formerly circuit sales instructor and co-ordinator, Madison, Wis. He holds an M.S. degree from the New York University School of Retailing.

(Continued on page 18A)



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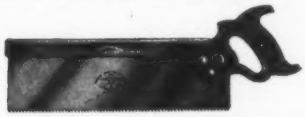

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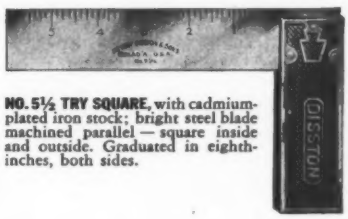

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STANLEY TOOLS

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Educational Dept., New Britain, Conn.

(Continued from page 448)

♦ SUPT. F. L. SCHLAGLE, Kansas City, Kans., has been appointed by Governor Payne H. Ratner, to fill the unexpired term on the Kansas State Board, left vacant when Rees Hughes was appointed to the presidency of Kansas State Teachers College, Pittsburg, Kans.

♦ CLYDE KEENER, whose specialty is auto mechanics and transportation, has been appointed to the faculty of the Industrial-Education Division of the Santa Barbara State College, Santa Barbara, Calif. After having been employed in automotive repair and ignition work over many years, Mr. Keener received his experience as a teacher in connection with the high school in Visalia, Calif.

♦ WESLEY B. SIBLEY was appointed as co-ordinator of apprentice training in Pontiac, Mich., to replace George L. Clark who was made director of curriculum for the local secondary schools.

♦ WILBUR HUSTED, formerly instructor in woodworking and farm shop at Onekama, Mich., has been appointed to teach in the industrial-arts and vocational department of the high school at Three Rivers, Mich.

♦ WILLIAM ZAHN, formerly instructor in auto mechanics in the Arthur Hill Trade School, Saginaw, Mich., has resigned to accept a position as civilian flying instructor in Ohio. Geo. Morris was appointed to replace him at the trade school.

♦ JOHN BROPHY, former assistant instructor in printing at The Stout Institute, has been appointed as supervisor of defense training classes in the vocational school at Green Bay, Wis.

♦ LONDIS FERGUSON, former director of the Vocational School at Niagara, Wis., has been appointed director of the new vocational school at Sturgeon Bay, Wis.

♦ JOHN A. KUBIAK, former co-ordinator of the Wausau Vocational and Adult Education School, Wausau, Wis., has been put on the staff of the State Board of Vocational and Adult Education, Madison, Wis.

♦ ELVIS H. FUNK, formerly co-ordinator of the vocational school, Watertown, Wis., has been appointed co-ordinator of the vocational school at Appleton, Wis.

♦ H. F. BRICKLEY, director of industrial arts and vocational education, Muncie, Ind., has been granted leave of absence to assume the duties of Assistant State Supervisor of Vocational Education for National Defense in Indiana.

♦ CARL H. WALLER has been made the co-ordinator of Child Study in the public schools of Madison, Wis.

♦ CHARLES RICE has accepted a position on the staff of the industrial-arts department of the Western Washington College of Education, Bellingham, Wash.

♦ ARNOLD HESS, a past president of the School Crafts Club, New York City, was appointed to the school board of the city of Newark, N. J.

ASSOCIATION NEWS

THE A.V.A. CONVENTION

Those who attend the A.V.A. convention at Boston will find much of interest in this historic city, its schools which can trace back their efforts in industrial arts and vocational education to very early dates, its business and industrial enterprises, and in its cultural offerings.

The convention program, too, will be crowded with matters that are of special importance at this time. Teachers of industrial arts, part-time and full-time vocational training, agricultural subjects, defense training, vocational guidance and teacher training, all will derive great profit from attendance at this memorable gathering in this hub of the industrial East.

The National Association of State Directors of Vocational Education will hold its meetings on Monday and Tuesday, Dec. 8 and 9, at the Hotel Statler at Boston.

The industrial-arts section, under Dr. Homer J. Smith, has arranged for the following five sessions:

Thursday, December 11, 9 a.m. Theme: *Industrial Arts In General Education.* Chairman: Richard M. Savage, director, industrial-arts department, Gorham Normal School, Gorham, Me., and state supervisor of industrial arts. *Trends* — Frank C. Moore, director of industrial arts, board of education, Cleveland, Ohio. *Planning the Program* — John F. Friese, associate professor of industrial education, Pennsylvania State College, State College, Pa. *Preparing the Shops* — Willis A. Whitehead, professor of industrial-arts education, State Teachers College, Fitchburg, Mass. Discussion, until 11:30. *Brief Report As Chairman of Subcommittee on Research* — Louis V. Newkirk.

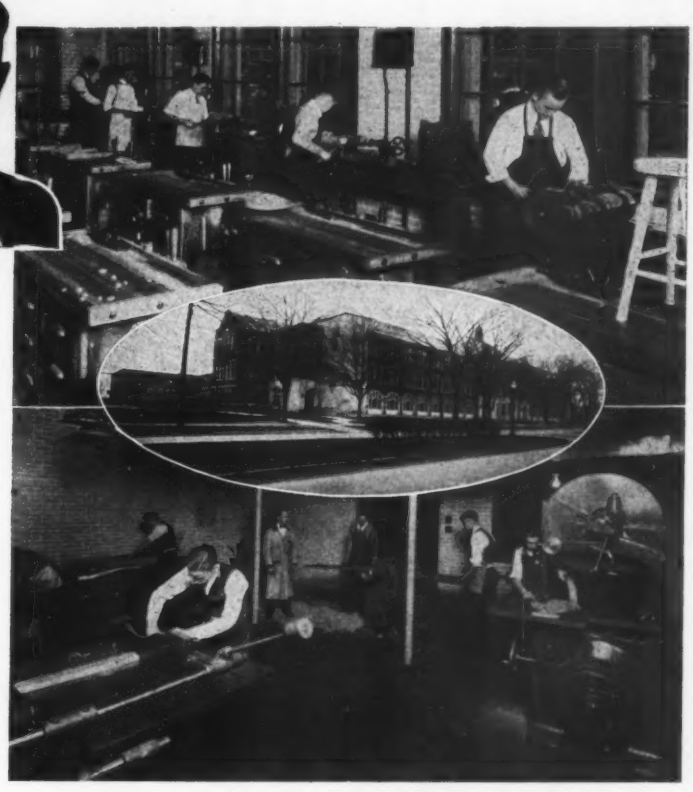
Friday, December 12, 9 a.m. Theme: *Industrial Arts Below the High School.* Chairman: Augustus F. Rose, director of manual arts, board of education, Providence, R. I. *The Elementary Grades* — Louis V. Newkirk, director of industrial arts, board of education, Chicago, Ill. *The Junior High School Years* — Earl L. Bedell, director of vocational education, board of education, Detroit, Mich., and professor of vocational education, Wayne University, Detroit. Discussion, until 11:30. *Brief Report As Representative on Central Research Committee* — Arthur B. Mays.

Friday, December 12, 2 p.m. Theme: *Industrial Arts in the High School.* Chairman: Raymond W. Phipps, chairman, division of industrial arts and vocational-industrial education, Teachers College of Connecticut, New Britain, Conn., and state supervisor of arts and industries. *Increasing Responsibilities in the Senior Schools* — Ralph E.

(Continued on page 20A)

LANSING MICHIGAN SCHOOLS CONTINUE TO BUY and USE "OLIVER" Woodworking Machines

Orville Flory, Instructor of Woodworking at Eastern High School, Lansing, Michigan



Views of the school building and interior of the Oliver equipped woodworking department.

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(Continued from page 18A)

Pickett, associate dean, School of Education, New York University, New York, N. Y. *Interrelationships of Industrial Arts and Vocational Training* — Lawrence F. Ashley, chief, division of vocational education, board of education, Yonkers, N. Y. Discussion — led by John J. Metz, editor, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, Bruce Publishing Co., Milwaukee, Wis. *Brief Report As Representative on Editorial Board* — Emanuel E. Ericson.

Saturday, December 13, 9 a.m. Theme: *Priorities in Industrial Arts.* Chairman: Willis B. Anthony, director, industrial arts department, State Teachers College, Fitchburg, Mass. *Contributions to Guidance Through Industrial Arts* — William J. Micheels, instructor in industrial education, University of Minnesota, Minneapolis, Minn. *Versatility and Other Youth-Serving Goals in Industrial Arts* — Arthur B. Mays, professor of industrial education, University of Illinois. Discussion, until 11:30. *Brief Report As Vice-President* — Homer J. Smith.

Industrial Arts Luncheon
(An A.V.A. Convention Feature)

Saturday, December 13, 12 noon. Ballroom, Hotel Statler. Theme: *Industrial Arts and Prevocational Education.* Chairman: Edward C. Emerson, associate director of manual arts, school committee, Boston, Mass. Toastmaster: Norman D. Anderson, supervising principal, vocational center schools, Chicago, Ill. *Early Development of Prevocational Education* — Arthur L. Gould, superintendent of schools, Boston, Mass. *Recent Growth and Philosophy of Prevocational education* — William H. Johnson, superintendent of schools, Chicago, Ill.

Breakfast Meeting

Thursday, December 11, 7:30 to 9:30 a.m. Presiding: Edward Berman, assistant superintendent of schools, Bayonne, N. J. *Round-Table Discussion of Current Problems in the Field of Vocational Education.*

Luncheon Meeting

Joint luncheon of the National Association of Trade School Principals and the National Association of City Directors.

Wednesday, December 10, 12:30 p.m., and for the balance of the afternoon. Topic: *Implications of the National Defense Training Program for the Future of Vocational Education.* Chairman: Edward Berman, assistant superintendent of schools, Bayonne, N. J. Panel Discussion: Warren K. Begeman, principal, Hadley Technical High School, St. Louis, Mo.; Frank P. Bradley, assistant supervisor for promotion, Defense Training Program, Hartford, Conn.; Howard A. Campion, assistant superintendent of schools, Los Angeles, Calif.; Walter B. Dennen, director, Boys' Trade School, Worcester, Mass.; Lynn A. Emerson, professor of industrial education, Cornell University, Ithaca, N. Y.; Robert A. Hoppock, chairman, department of guidance and personnel administration, New York University, New York City; Franklin J. Keller, principal, Metropolitan Vocational High School, New York City; Ronald W. Kent, assistant director, Essex County vocational schools, Newark, N. J.; Esther L. McNellis, master, Trade School for Girls, Boston, Mass.; Violet O'Reilly, principal, L. E. Rabouin Vocational School, New Orleans, La.; Blanche M. Penn, assistant supervisor, Girls' Trades Division of Instruction, Hartford, Conn. Summary: O. H. Day, director of vocational education, Kansas City, Mo.

FOUR-STATE CONFERENCE ON INDUSTRIAL ARTS

The fourth Annual Four-State Regional Conference on Industrial Arts was held at Kansas State Teachers College, Pittsburg, Friday and Saturday, October 10 and 11, 1941. Because of emergency demands on the schools, the attendance fell somewhat below that of last year, but the general opinion was that the program surpassed those of previous years in value and interest.

The principal speaker from outside the immediate territory of the Conference was Dr. Maris M. Proffitt, educational consultant, U. S. Office of Education, Washington, D. C. The faculty of the department of industrial education of the college gave a dinner for Dr. Proffitt on Thursday evening which was attended by about 50 educational leaders from Pittsburg and near-by towns, followed by an informal exchange of views including some report on activities in war-time Washington.

Each session of the Conference was given over to the consideration of a single major topic, and the committee instructed the chairman and speakers to limit themselves to not more than 50 per cent of the allotted time, thus insuring provision for general discussion, questions, and answers at each session. Each session started exactly at the time scheduled, and no session was permitted to run past the time scheduled for adjournment.

The general topic assigned for the first session, Friday morning, was, "Relationships Between Industrial Arts and Vocational Education," Professor Walter L. Friley, Kansas State Teachers College, chairman. The first speaker was Dr. DeWitt T. Hunt, Oklahoma A & M College, Stillwater, who distributed duplicated copies of his paper. In parallel columns, he compared industrial arts and vocational education with respect to aims and objectives, qualifications of teachers, enrollment, plans for promotion and supervision, and other significant features.

The second speaker was C. M. Miller, director of vocational education, State Board for Vocational Education, Topeka, Kans., who told the

(Continued on page 23A)

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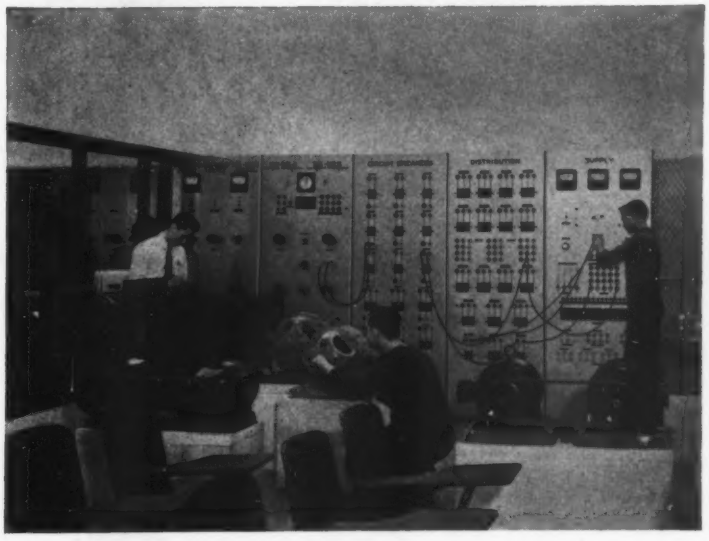

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(Continued from page 20A)

story of the contribution to national defense now being made by the public schools, and especially by the vocational schools.

He predicted that in the near future we shall see a movement launched to secure federal subsidies for the promotion and maintenance of industrial arts in the public schools.

The second session, Friday afternoon, was devoted to a discussion of "Guidance and Placement," and the chairman was W. T. Markham, former state superintendent of public instruction, and now state supervisor of occupational information and guidance, State Board for Vocational Education, Topeka, Kans. The program began with an address by H. T. Sheel, supervisor of teacher and junior placement, Kansas State Employment Service, Topeka, who presented an outline of recent developments in national and state legislation in the field of employment service, and in particular the services available in Kansas.

The second speaker, R. L. Jewell, superintendent of schools, Sedan, Kans., gave a spirited and informative description of a program of guidance for a small high school, with numerous illustrations and applications to individual cases.

Following the annual dinner, the topic assigned for the Friday evening session was "Industrial Education for the Public School Administrator," and the chairman was George H. Hargitt, supervisor of industrial arts, St. Louis, Mo., who explained that the term, industrial education, is used in its broad sense to include not only vocational training in trades and industry, but also industrial arts, the foundation work so essential if an effective program of trade training is to be organized.

The first speaker was James W. Reynolds, assistant dean, Junior College, Fort Smith, Ark., whose address was a carefully thought-out exposition of the major thesis, "No junior college program is complete without a well-developed program of industrial arts." He was followed by T. H. Broad, principal of the Daniel Webster High School, Tulsa, Okla., who discussed the objectives and curriculum of the secondary school in relation to the needs of young people in an industrial society (as contrasted with the traditional college preparatory curriculum), and the place of industrial arts in such a curriculum, from the standpoint of the administrator.

Probably the high spot of the Conference was the Saturday morning session on "Present-Day Trends in Industrial Education," with Verne L. Pickens, supervisor of practical arts, Kansas City, Mo., presiding as chairman. The program opened with an address by Professor Noel B. Grinstead, head of department of industrial education, State Teachers College, Warrensburg, Mo., who limited his part of the discussion to trends in industrial arts: (*a*) in the content of the curriculum, (*b*) in problems of selection and organization of subject matter, and (*c*) in qualifications of teachers.

The second address was given by Raymond B. McHenry, director of industrial education, Tulsa, Okla., who discussed trends in the development of the vocational-industrial program in a city school system.

Next was the address by Dr. Maris M. Proffitt, U. S. Office of Education, who from the national point of view discussed the significant changes that are taking place in the statements of the objectives of public education, including industrial arts, and declared that there is a notable trend in the direction of a broadened and enriched program of activities. This development takes the form of an increase in the number and variety of media and experiences, and increasing emphasis upon information concerning industry and the processes and products of industry.

Also, "the outstanding trend in industrial arts today is toward the general-shop form of organization." The speaker outlined the reasons for believing that this trend will continue.

Other significant trends are in the direction of increased enrollment in industrial arts in junior and senior high school, and in the direction of higher standards of qualifications of teachers, with emphasis on underlying philosophy, current movements in education, principles and practices in school organization, psychology of child life, and study of changing social patterns and their impact on public education.

"In general, it may be said that the observable trends in industrial arts are in step with modern principles of education and the experience curriculum. They take into account individual pupil differences that are significant as to learning ability, also interests and ability levels of pupils. They indicate a strong movement toward enrichment of pupil experiences. They show attempts to broaden instruction by including opportunities for acquisition of knowledge about materials, tools, products, and services of industry, and the part played by industry in the determination of social patterns."

The final session of the Conference, Saturday afternoon, was devoted to a discussion of "Some Problems of the Shop Teacher." The chairman was W. F. Currier, director of industrial education, Coffeyville, Kans. At the request of the committee, teachers and supervisors of industrial arts in the four states submitted in advance questions and problems which they wished to hear discussed. The problems submitted were classified under several convenient headings, and were distributed to the audience in duplicated form. Without regularly assigned speakers, the session developed into a lively discussion under the guidance of the chairman.

Before adjournment it was voted unanimously

(Continued on page 24A)

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STARRETT TOOLS

committee chairmen promise an unusually active year.

Jerome Wheeler, superintendent of the Dunkirk public schools, in welcoming the group stated, "Industrial arts doesn't cover enough territory in view of modern-day demands on the individual. The day is not too far off when science and the arts will form the basic school curriculum."

The various committees as appointed by Michael Blawat, president of the association, are:

Industrial Arts in the Elementary Schools: George E. Schultz, Julius C. Braun, and Herman E. Landel.

Legislation and Industrial-Arts Trends: Fred C. Finsterbach, Walter Weber, and Edward L. Morrice.

State Industrial-Arts Prizes for High Schools: Jerome Wilker and Lynn P. Nichols.

Revenue and Investments: George Linnaberry, Carl E. Minich, and Edward Orgek.

Budget: Wesley Leech and executive committee.

Publicity: Julius C. Braun, Arthur Harbison, Herman Landel, and Byron Schottin.

Membership: George Wakeman, Harold S. Boomer, Richard Schoonover, and John Tuskey.

Duplicating: Edward L. Morrice, inactive student members, and executive committee.

Demonstrations and Exhibits: Ralph Thomas, Wilber Morganfeld, and Herbert Zollitch.

Professional Literature: Carl E. Minich, Harold S. Boomer, Fred C. Finsterbach, Julius C. Braun, Jerome Wilker, and Edward L. Morrice.

Shop Standards: Edward Orgek, Humphrey Sgroi, Wilber Morganfeld, Clifford Taylor, and John Tuskey.

Association Projects: John Tuskey and Herbert Zollitch.

Special Committee for Banquet: George Schultz and Humphrey Sgroi.

The officers of the association for 1941–42 are: president: Michael Blawat, Silver Creek; vice-president: Wesley Leech, Kenmore; secretary: Arthur Harbison, Fredonia; editor: Harold Boomer, Iroquois; historian: Herman Landel, Snyder; treasurer: George Wakeman, Orchard Park.

♦ The 14th Annual Convention of the Nova Scotia Industrial Arts Teachers Association was held at Truro, N. S., Canada, September 26 and 27, 1941.

The officers elected for the coming year are honorary pres., E. K. Ford, Halifax; pres., N. C. Houseman, Sydney; vice-pres., Hugh K. Hamilton, New Waterford; secy.-treas., Chas. L. Wood, Windsor.

The outstanding piece of business at the convention was the appointing of a compiling committee to arrange a new industrial-arts course for the schools of Nova Scotia. D. L. Whitby, principal of the Truro Mechanic Science School was appointed head of the committee. Other members are: George Sutherland, Amherst; Harland Clark, Sydney; A. Gerald Fraser, Halifax; Stewart Murray, Pictou; Charles L. Wood, Windsor.

George Adams presented a paper on auto mechanics; N. A. Campbell on cabinetmaking; N. C. Houseman on building construction; A. R. Patton on draftsmanship; Lockhart Ferguson on metalworking; Grant MacGregor on machine tool operation.

Robert Danson explained the duties of the electrician in an airplane factory.

♦ An industrial-arts society was organized on October 30, 1941, at a meeting of the students and faculty of the Southern Illinois Normal University, Carbondale, Ill.

The organization was proposed by Delmar W. Olson, J. Henry Schroeder, and Homer Rose, faculty members, as an essential step toward qualifying for a campus chapter of Epsilon Pi Tau, national honorary Industrial-Arts fraternity.

The possible services of the society to the individual student, to the Industrial-Arts Depart-

(Continued on page 26A)

(Continued from page 23A)

to request the president of Kansas State Teachers College to call another session of the Conference in the fall of 1942, the dates to be determined by the committee.

The Four-State Regional Conference on Problems of the Industrial-Arts Teacher and Supervisor is called each year by the president of Kansas State Teachers College, at the request of the industrial-arts forces, to meet in Pittsburg, which is strategically located almost at the geographical center of the region.

The primary purpose of the Conference is to bring within the reach of as many industrial-arts teachers as possible the benefits of a professional program such as is otherwise available only in the great national conventions which teachers almost never have the opportunity to attend. It is generally recognized that this goal is being achieved in a splendid way, for the programs of the Four-State Conference are not surpassed anywhere in quality or timeliness of discussion.

The management of the Conference has been entrusted to a General Committee on Arrangements and Program, consisting of 16 leading teachers and directors representing the four states, headed up by an executive committee of three members of the faculty of the department of industrial education, Kansas State Teachers College, Pittsburg: Professor R. L. Schwanzle, Dr. O. A. Hankammer, and Dr. William T. Bawden, chairman.

Among the outstanding features of the Conference are the commercial exhibits which each year are extensive enough to fill the assembly room of the industrial-education department. Space for the exhibits is provided by the college, and opportunity is afforded to examine new books, tools, and other items of equipment.

♦ The Western New York Industrial Arts Teachers Association met at the high school at Dunkirk, N. Y., on October 7, 1941, for their regular monthly program. George Willis, local director of industrial arts and his staff served as hosts. Activity reports presented by the various

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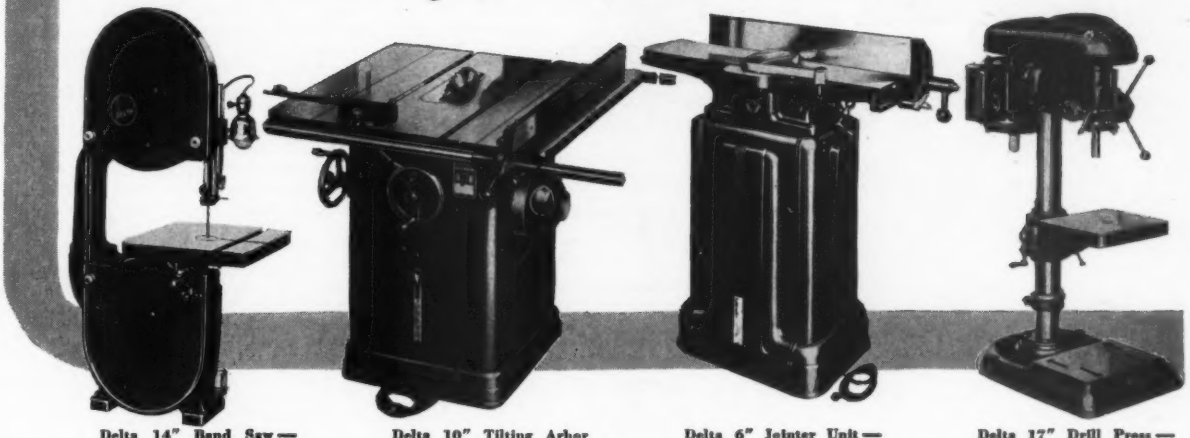

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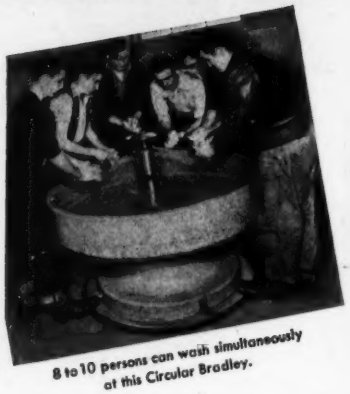

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Below: Bradley Multi-Stall Showers with two Bradley Washfountains at left.

(Continued from page 24A)

ment, to Southern Illinois Normal University, and to the profession, had been fully discussed at a previous meeting.

♦ The fifth annual Southern Conference on Audio-Visual Education was held at the Ansley Hotel, Atlanta, Ga., on November 13, 14, and 15, 1941.

Six sessions were held in all of which the production and use of audio-visual teaching aids used in the school shop and in the classroom were discussed.

♦ The School Crafts Club started its 40th year on Saturday evening, October 18, 1941, with the election of officers. MR. OSCAR F. RAAB of West Orange, N. J., was elected president.

An interesting talk and demonstration on "Tin Cans and Homemade Tools: What You Can Do With Them" was delivered by Mr. Robert Friedling.

MR. ARNOLD HESS, a past president of the Club, has been appointed to the School Board of the city of Newark, N. J.

♦ The first meeting for 1941–42 of the Fairfield County Industrial-Arts Association was a dinner meeting held at the Bassick High School in Bridgeport on Wednesday, September 24, 1941. Following the dinner served in the school cafeteria, committee reports were read and discussed. The membership of the association has reached an all-time high mark and there are indications that new members are forthcoming. An interesting discussion was held regarding the necessity of securing priority ratings for industrial-arts materials. Reports were made by Fairfield County representatives in the Connecticut, New England, and American Industrial-Arts Associations emphasizing the need for 100 per cent cooperation of members in all organizations toward ultimate success of all ventures.

During the evening a demonstration was given through the courtesy of Patterson Brothers of New York City, of a new and inexpensive welding outfit. Following visitation of the school shops, the first fall business meeting was held with President G. Wesley Ketcham presiding.

♦ The Industrial Arts Section of the Western Zone Convention of the New York State Teachers Association sponsored a 15-minute broadcast over WGR on October 22, to inform parents and others of the progress which has been made in the field of industrial-arts education.

♦ The West Virginia Arts Conference will be held at West Virginia Institute of Technology, Montgomery, W. Va., on Saturday, April 18, 1942.

♦ The seventh annual convention of the Wisconsin Association for Vocational and Adult Education will be held at Madison, Wis., on May 1 and 2, 1942. Hotel Loraine will be the headquarters.

♦ Persons engaged in graphic-arts education throughout the United States are being offered a new national professional program by the National Association for Printing Education which began operation in September.

The new organization was founded and is now being managed by its Committee for Organization which is composed of 12 men representing the many different types of printing schools in all sections of the country. The intention of the Committee is to provide a truly professional "Share Your Knowledge" group similar to that of the Craftsmen, the majority of the Committee being active and prominent Craftsmen. This novel, exclusively educational association operates on an entirely democratic basis and seeks to provide benefits, publications, sectional and national meetings and exchange services not heretofore provided for the graphic-arts educator.

The Committee for Organization is headed by Harold E. Sanger of the Chicago School of Printing and Lithography, who serves as its executive secretary. R. Randolph Karch, of Cincinnati Printing High School, is Director of Publications, and Floyd C. Larson, of the City Schools of Menominee, Mich., is Assistant Publications Director and editor of the *National Printing Education Journal*, the official monthly magazine.

Other members of the Committee for Organization are: Fred W. Miller, Masonic School of Printing, Fort Worth, Tex.; Ward W. Swain, Washington Vocational High School Pittsburgh, Pa.; Harold G. Crankshaw, Central High School, Washington, D. C.; Ralph T. Bishop, State College of Education, Greeley, Colo.; Allison J. McNay, The Media Press, Los Angeles, Calif.; Leroy Brewington, State Teachers College, Pittsburg, Kans.; Harold H. Kirk, Langley Junior High School, Washington, D. C.; William R. Baker, Stout Institute, Menomonie, Wis.; and John C. Tranbarger, State Teachers College, Terre Haute, Ind.

An important activity of the new National Association for Printing Education is its Student Honor Division headed by Harold H. Kirk, of Washington, D. C., as director. This activity will provide for student printing classes and clubs, a national program of news and exchange services, and will conduct national student competitions of many varieties. The "Student Craft News," which is to appear as one section of the *National Printing Education Journal*, will carry the country-wide news items of the student clubs and each month will feature through its Craftolite an outstanding student printer and club member as chosen by the Council. The Council of the Student Honor Division is composed of: Edward W. Kurtz, Jefferson Intermediate School, Detroit, Mich.; George T. Hart, Washington High School, Rochester, N. Y., and Brewington, Miller, and McNay of the Organization Committee.

Officers of the N.A.P.E. will be elected in May, 1942, and installed at the annual convention of the association in August.

"He'll be an all 'round welder when HE graduates"

INDUSTRY, today, demands "all round" welding operators—welders who know a-c, d-c, and atomic-hydrogen welding.

Your graduates, if they are trained on all types of welders, will have a head-start when it comes to getting preferential ratings for jobs—because their ability won't be limited to just *one* type of welding.

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Your nearest G-E arc welding distributor or G-E office is a reliable source of supply for modern welding equipment and for unbiased information on all phases of arc welding technique and procedure. Why not call today? No obligation. General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

NEWS NOTES

♦ Through the cooperation of a committee of the Manual Arts Conference of the Mississippi Valley and the School of Printing of Kansas State Teachers College a set of portraits of industrial-arts leaders has been made available for distribution. The men chosen by the Committee for this year's collection are: Professor Robert W. Selvidge, University of Missouri; Dr. Homer J. Smith, University of Minnesota; Professor Arthur B. Mays, University of Illinois; and Dr. William T. Bawden, Kansas State Teachers College. The portraits are printed on heavy calendared paper, 8½ by 11 in., suitable for framing. Last year the committee distributed a portrait of Charles A. Bennett, founder and first chairman of the conference. While the limited supply lasts, the set of five portraits may be obtained by sending one dollar to Industrial Education Department, Kansas State Teachers College, Pittsburg, Kans. Money will be refunded if received too late.

♦ "Behind The Type," the life of Frederic W. Goudy, foremost type designer of modern times, has been published by the department of printing at Carnegie Institute of Technology.

The volume was produced as a student project during the past two years by the class in printing production. The work was done under the supervision of Charles W. Pitkin, assistant professor of typography; Stanley Hlasta, monotype composition; Homer E. Sterling, assistant professor, illustrations and binding; Kenneth R. Burchard, presswork; and Professor Glen U. Cleeton, head of the department, proofreading.

"Behind The Type" is printed in a Goudy-designed type face, Monotype Goudy Village 410. Included in the volume is an address by Mr. Goudy given at a printing meeting at Carnegie Tech in 1938 on the subject, "The Ethics and Aesthetics of Type and Typography." The book, consisting of 128 pages, sized 6 by 9 in., and bound in paper boards, contains 17 illustrations in collotype. The preface is by Professor Cleeton.

♦ Instructors are being sought by the War Department for its Armored Force School at Fort Knox, Ky. Approximately 100 positions are to be filled through the civil service examination procedure, it was announced by the Civil Service Commission today. The examination announcement just issued, covers five grades of positions with salaries ranging from $2,000 for junior instructors to $4,600 a year for senior instructors. Optional branches of instruction for which persons are being sought are radial engines, internal-combustion engines, motorcycles, automotive (chassis less the engine), radio operating, and radio electrical. Instructors will plan the courses of instruction, prepare and revise text material, and conduct classes in these options. Instruction in the maintenance, repair, and overhaul of all mobile armored combat equipment of the Armored Force is to be given.

Shop experience or technical experience—including some as a shop foreman or responsible instructor—in one of the specific optional branches of instruction, is necessary. In addition for senior instructors, two years of experience in supervising other instructors or shop foremen is required. For part of the general shop or technical experience applicants may substitute successfully completed study in a residence course in engineering in a university or technical school, or in a teacher-training course in vocational education, trade and industrial education, or industrial arts. No written test is to be given; however, after an initial rating on applicants' education and experience, an oral test may be given to a sufficient number of eligibles to meet the needs of the school.

Applications will be rated as soon as practicable after their receipt at the commission's Washington Office until further public notice. Qualified persons are urged to apply at once. Further information and the necessary forms to apply may be obtained from the commission's secretary at any first- or second-class post office, or from the commission in Washington, D. C.

The government continues its search for specialists in all branches of industry and business. The Federal Civil Service examination for industrial specialist, announced on July 7, has been amended to remain open for receipt of applications until further notice.

The National Defense Program needs men with experience in one or more of the following fields: iron and steel; nonferrous metals; machine tools; ordnance; aircraft, marine, and automotive equipment; railroad repair shops; radio and other electrical equipment, supplies, and apparatus; textiles; forest products; paper; printing and publishing; chemicals and allied products; plastics; petroleum and coal products; rubber products; stone, clay, and glass products; leather and its manufactures; food and kindred products.

Salaries range from $2,600 to $5,600 in the various grades. No written examination is given. Application forms may be obtained from civil service representatives at any first- or second-class post office or at a civil service district office.

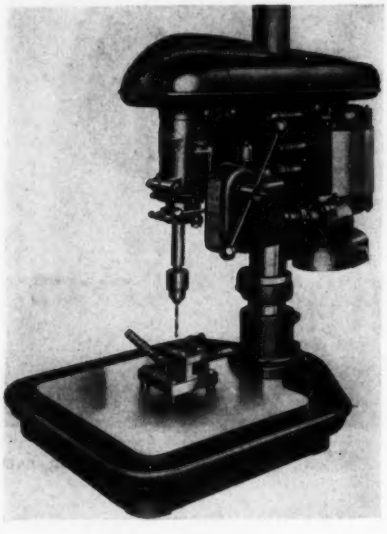
♦ Plastics in the schools are an invaluable aid in the teaching of mathematics as demonstrated by the handsome set of Geometric Figures produced by the Colorsite Co., Sturgis, Mich., and designed by Mr. E. S. Jamieson, headmaster, Howe Military School, deceased, and Mr. H. E. Davis of that company.

Bidding fair to replace the solid wood blocks, which because of their solidity and opaque qualities have failed in their demonstration of true mathematical principles, these transparent cubes, prism, cylinders, pyramids, cones, and altitude sticks, molded from plastic polystyrene and tenite in stimulating and interesting colors, represent a distinct contribution to pedagogy.

SHOP EQUIPMENT NEWS
New Products—Publications

THE NEW DELTA DRILL PRESS

A new and improved type of low-cost power-feed drill press has just been announced by The Delta Manufacturing Co., 600 E. Vienna Ave., Milwaukee, Wis. The unusual design of the power-feed unit, which operates directly off the bottom drive of the motor, makes possible a range of feeds, from .0010 to .016 in. per revolution of spindle in the slow-speed drill presses and from .0005 to .009 in the high-speed machines. Two 4-step cone pulleys and a special belt-tension release make feed-speed changes quick and safe. The heart of the power feed is the husky bronze gear and the specially hardened and ground steel worm that assure positive



Delta drill press

accurate stopping and long satisfactory service. Other special features include: quick traverse by hand from starting position to work; instant switching from power to hand feed and reverse without changing or removing parts; safety lock for preventing damage to drill press when power feed is disengaged; and adjustable automatic stop and return. This new line includes single and multiple spindle 17-in. units, in slow-speed and high-speed models, with table-raising or head-raising mechanisms, powered with either Delta or standard Nema frame motors.

ATKOMATIC HIGH PRESSURE VALVES

The standard line of Atkomatic valves, for operating pressures up to 300 lb. pressure, has been recently supplemented with a line of high-pressure valves, for operating pressures up to 3000 lb. They are a product of E. C. Atkins and Co., Indianapolis, Ind.

These valves are made in the following sizes: ½ in., ¾ in., and 1½ in.

Under certain conditions, when used on liquids, a certain amount of timing control may be obtained on opening and closing speeds. As an example, take the Atkomatic high-pressure valves, operating a 250-ton press at 1000 lb. oil pressure, with full remote control. When the press hits full load, the pressure immediately goes to the original accumulator pressure with no time lag, due to the special automatic arrangement.

Atkomatic high-pressure valves offer tremendous possibilities in the general industrial field for automatic and remote control.

Valves are made of bronze. They are packless, with renewable seats and disks, and their construction is exceptionally rugged. They are made with screwed ends. Seat diameters can be furnished up to full pipe size. Bubble-tight pilot assembly can be furnished for air and gas operation.

NEW AIR-CONDITIONING UNIT FOR AIR PAINTING

A new compact unit which removes water, oil, and impurities from the air line, absorbs pulsations, and provides a regulated flow of air, is announced by the Paasche Airbrush Co., 1909–23 Diversey Parkway, Chicago, Ill.

This air-conditioning unit combines a new type of air regulator and a compact air purifier. The latter is distributed exclusively by Paasche to the air painting field.

Air conditioning unit for spray painting

The unit can be used for small spray painting jobs. The purifier lasts as long as six months or more before needing replacement. For air painting on a production scale, the purifier itself can be used as an auxiliary to the larger separator on the air line. In this case it removes the last vestige of water that condenses in the air line or is not otherwise trapped; and provides clean dry air, even during periods of high humidity. Where lacquer is used in finishing, the new purifier is especially valuable as it prevents "blushing" or lacquer fading due to moisture in the air line. When used in production spraying the purifier remains effective for 240 hours of steady spraying. Standard ¼-in. pipe-thread fitting makes installation easy.

The purifier also traps all filterable bacteria, odors, and gases, making it desirable for those having pure-air requirements.

Regulator and purifier may be purchased separately.

A new bulletin describing the complete unit is available.

NEW A.C. ARC WELDERS

Marquette Manufacturing Co., Inc., Minneapolis, Minn., have perfected several new series of a.c. arc welders which are guaranteed to produce high-quality welds, although they require nothing more than plugging in the ground cable to the ground tap, and the electrode cable to the desired amperage to be ready for operation.

Model 160 has a range of 20 to 125 amp., 220 volts, 50–60 cycles. It is for light sheet-metal work and handles 1/16 to ⅛-in. electrodes.

Model 161 has a range of 20 to 175 amp. and handles slightly heavier work than Model 160. It accommodates 1/16 to 5/32-in. electrodes.

Model 162 has a range of 20 to 250 amp. and will handle heavier work than Models 160 and 161. It uses 1/16 to ¼-in. electrodes. This size may also be obtained mounted on a small truck for greater portability.

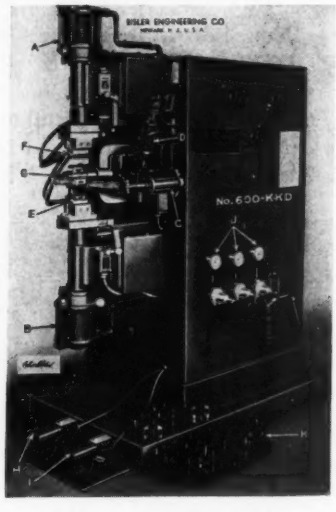
Model 100 BB, 20–150 amp., welds sheet steel and small cast iron and steel castings. It is capable of handling electrodes from 1/16 to 5/32 in.

Model 20 BB has a range of 20 to 200 amp., handles 1/16 to 3/16-in. electrodes.

All of these welders have accurately calibrated heat stages, plainly marked, so that the operator can make quick positive mechanical connections. Each of these welders comes with an 8-ft. power cord, 15 ft. extra flexible welding cable, and 15 ft. ground cable together with all necessary clamps and plug-in connections. Also a full vision helmet equipped with a No. 10 lens, and an assortment of welding electrodes.

AIR-OPERATED PROJECTION WELDER

The Eisler Engineering Co., Inc., of Newark, N. J., has recently placed on the market a special Air-Operated Projection Spot Welding Machine No. 600-KKD. This machine is arranged with special welding jigs and fixtures for welding fins to steel tubing. No individual jig is needed for



Eisler air-operated welder

loading the work. There are 56 points of heat control and the Transformer secondary, welding dies, and mandrel are water cooled throughout.

The rotating mandrel is operated by air and fully automatically controlled. The main features of this welder are as follows: (*a*) air cylinder for upper welding die; (*b*) air cylinder for lower welding die; (*c*) air cylinder for the ejector mechanism; (*d*) air cylinder for indexing the rotating mandrel; (*e*) lower welding die; (*f*) upper welding die; (*g*) mandrel; (*h*) foot pedal for actuating ejecting mechanism; (*i*) foot pedal for actuating cylinders *A* and *B*; (*j*) pressure gauges — for *A* and *B* cylinders, *C* cylinder, and *D* cylinder; (*k*) finished product.

The pressure for each set of air cylinders can be regulated individually to meet specific requirements. The machine is so wired that the ejector mechanism cannot operate while the welding dies are in motion, nor will the welding dies operate while the ejector mechanism is in motion. The actual welding time is controlled by automatic-timing equipment.

NEW WALL CHART ON ROUTERS

An educational chart on routers for school shop use, this new wall chart shows the different sizes of Carter Routers and all the accessories available for work with each one.

It also illustrates and lists the many different sizes and types of Standard Bits for Carter Routers, and shows their adaptation for making various kinds of decorative finishing cuts.

This handy, 29 by 39-in. wall chart is printed

(Continued on page 33A)

HANDICRAFTS
BUY NOW!

Leathercraft
Metalcraft
Wrought Iron
Art Materials
Clays
Archery
Basketry
Beadcraft
Block Printing
Plastics
Felt Craft
Spongex
Weaving
Deco Wood
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Etc.

We don't want to be alarmists but the plain facts are these:

The Government has placed defense priorities on many items—such as metals, tools and chemicals—many of which are used in Art, Industrial Art and Vocational Courses. Many of these items are no longer obtainable, others are advancing in price almost daily.

The American Handicrafts Company still has huge stocks available in both New York and Los Angeles. **RUSH YOUR ORDERS TO US NOW**—while we can still take care of your requirements and before prices advance further. **NEXT MONTH OR NEXT TERM MAY BE TOO LATE!**

If you do not have a copy of our 80-page illustrated catalogue, send 10c in stamps or coin and we will rush it to you.

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is the highest grade. Shapes without cracking or peeling. Sheets up to 24"x36"; discs, 2" to 24" diameter. Write for further information and instruction sheets.

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Artizan MAKES HAMMER-SMITHING EASY

With this remarkable new tool, even beginning students can make articles from copper, aluminum, pewter, brass or silver, and give them a beautiful hand hammered finish.

The ARTIZAN hammers, surfaces, sinks, shapes, forms, pierces, engraves, files and does repousse work. Plugs in any socket. Weighs 1½ lbs. 900 strokes per minute. $29.50 postpaid with Accessories.

EVERY VOCATIONAL SCHOOL NEEDS THESE TWO TIME-SAVING TOOLS.

HANDEE* TOOL OF 1001 USES

A whole toolshop in one hand. For precision work on metals, alloys, plastics, wood, horn, bone, glass, etc. Original tool of this type and the favorite today.

Uses 300 accessories to grind, drill, polish, rout, cut, carve, sand, saw, sharpen, engrave. Plugs in any socket. Wt. 12 oz. 25,000 r. p. m. $10.50 postpaid, with 7 Accessories.

Order either Tool on 10 Days Money-Back Trial.

Save Hours of Hand Work

FREE 64-page CATALOG Describes all Handee Products and their wide application in crafts and industry all over the world

CHICAGO WHEEL & MFG. CO., 1101 W. Monroe, Dept. IA. Chicago, Illinois

(Continued from page 30A)

in two colors. It is obtainable from the R. L. Carter Division of The Stanley Works, New Britain, Conn., at a nominal charge of 25 cents per copy to cover handling and postage.

POST'S NEW WALL CHART

The new decimal-equivalent wall chart is now ready for distribution to those who ask for it on their business stationery.

This Post chart is really new and greatly different from others we have seen on the walls of drafting rooms.

Its first essential is that it is of *giant* size 26 by 39 in. Secondly, it is printed in large heavy type, 1¼ in. high, which can be easily read 50 ft. away. And lastly, it is printed in two colors, red and black on a white background making it attractive and more easily read.

For your copy, write The Frederick Post Co., 3650 N. Avondale Ave., Chicago.

NEW EDUCATIONAL APPOINTEE

The Behr-Manning Corp. Division of Norton Co., Troy, N. Y., announce that J. Harding Lisle, who has been in charge of their Educational Department, has been assigned to another division, and that his place will be filled by Robert H. Simmons, who will carry on the work so ably taken care of by Mr. Lisle in the past.

NEW CATALOG

The Brodhead Garrett Co., Inc., Cleveland, Ohio, have just issued their new catalog for the year 1941–42, in which are listed a wide variety of equipment and materials for use in industrial-arts and vocational-education shops.

The catalog contains directions for ordering and specifying different kinds of lumber, power machinery for woodworking and machine-shop practice, also a full line of benches and cabinets used in these and other school shops.

Then there is a listing of the hand tools used by workers in wood and metal, and in the automotive service areas.

A section of the book also is devoted to cabinet hardware and finishing material including brushes, glues, and abrasives.

Tools, supplies, and equipment for farm shops, electrical shops, tin shops, forging, art-metal work, welding, plastics, leatherwork, linoleum cutting, ceramics, weaving and basketry, art work, drafting, duplicators, office work, and bookbinding, are also listed.

The catalog also lists shopbooks.

Will you save a life?

NOT many of us can be spectacular heroes. Yet by buying Christmas Seals you save human life just as surely as if you had plunged into a burning building!

More people between the ages of 15 and 45 die from tuberculosis than from any other one disease. By using Christmas Seals you make possible a year-round campaign against this pestilence — a campaign that since 1907 has reduced the tuberculosis death rate 75%!

Help save more lives in 1942!

Buy CHRISTMAS SEALS

Your opportunity

CASCO
brings simplified industrial gluing to your shop!

● Now your students can make the same durable, foolproof, CASCO-glued joints obtained in leading industrial plants. CASCO adhesives save class period time, eliminate glue-pot fuss and assure you the right glue for *all* types of projects. Sold in Hardware Stores in all handy sizes.

STAINFREE, WATERPROOF, INSTANT MIXING

For veneering acid or light woods—for boats, garden furniture, sports equipment. CASCAMITE POWDERED RESIN GLUE opens the entire field of outdoor projects.

FOOLPROOF, EASY-TO-USE, WATER RESISTANT

For interior use. CASEIN CASCO POWDERED GLUE mixed in cold water, makes heavy duty weight-bearing wood joints. Ideal for beginners' not-too-perfect workmanship.

GLUES THE NEWER WORKSHOP MATERIALS

Sticks to metals, plastics, glass, fabrics. CASCO FLEXIBLE CEMENT withstands jolts and expansion of dissimilar materials. Ready to use.

FREE! GLUING "TEXT-BOOK"

Tells what glue to use. Includes complete mixing directions, liquid life, setting time, veneering, overlays, inlays. 36 pages, 56 illustrations. Covers all Casco glues.

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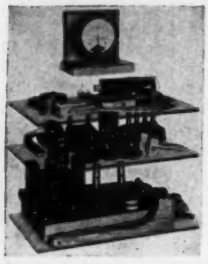

"Learning Electricity Experimentally," by C. S. Siskind of Purdue University's Electrical Engineering School, was written around our Model 100-G equipment.

A copy of this text is furnished with each 100-G set sold, enabling an instructor to set up a modern course in electricity immediately upon receiving his set.

Our equipment is being used extensively and recommended by Army, Navy, NYA and CCC Defense Training Schools for quick and efficient instruction in electricity.

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This clay is used in Schools and Art Institutions throughout the United States.

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Complete Tables
BLOW PIPES
Suitable sizes for school shops
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CABINET HARDWARE TOOLS AND SUPPLIES

Buy your tools, cabinet hardware and supplies at the right prices and at one place. Our Catalog K will be sent to Supervisors and Industrial Arts Instructors upon request — no obligation.

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1896 — ORIGINAL — 1941

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18 Models for Woodwork only
2 Actions — 3 Sizes
Write for Prices

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Woodstock, Ill.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS

Now available in 3 sizes
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No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilised Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

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LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies

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MELTOMATIC
PASTE SOLDER

FAST ECONOMICAL — SIMPLE STRONG

Make your soldering jobs easy. This new, fast method of soldering produces a fine job. You brush Meltomatic on the articles to be soldered, apply heat and the job is complete. Economical since very little waste is necessary and no special equipment needed.

Write for free sample and quotations as well as job sheets available.

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are Standard in School Shops!

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2 qt. $17
4 qt. $24
8 qt. $38
115 or 230 Volts

And here are the reasons: They're safe, fool-proof, built "like a boiler" to take plenty of shop abuse. Automatic Thermostat controls glue temperature; no burned or spoiled glue; no water jacket troubles; no fire hazards. Teach students modern, safe gluing methods with "Hold-Heet" — used by industry and schools everywhere!

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MOTION PICTURES

On The Operation of a Lathe

THE New South Bend 16 mm sound Kodachrome motion pictures on lathe work may be borrowed by industrial and vocational schools, colleges, universities, army and navy training schools, industrial apprentice schools, and other recognized organizations teaching machine shop practice.

The first reel entitled "The Lathe" clearly shows what a lathe is, what it is for, and how the various parts operate. Important operations including turning, facing and thread cutting, are demonstrated. The second reel "Plain Turning" shows in detail each operation in the machining of a cylindrical shaft held between the lathe centers. Close-ups show locating and drilling of center holes, application of cutting tools, use of calipers and micrometers, and operation of the lathe carriage and apron. The showing time for the two 800 ft. reels is approximately 40 minutes.

Bookings are being scheduled in the order which they are received. Fill in and return the coupon below for an early showing.

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Lathe Builders for 35 Years

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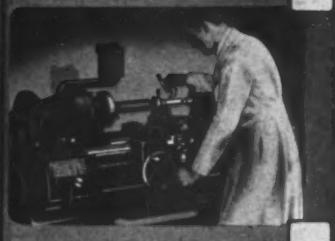

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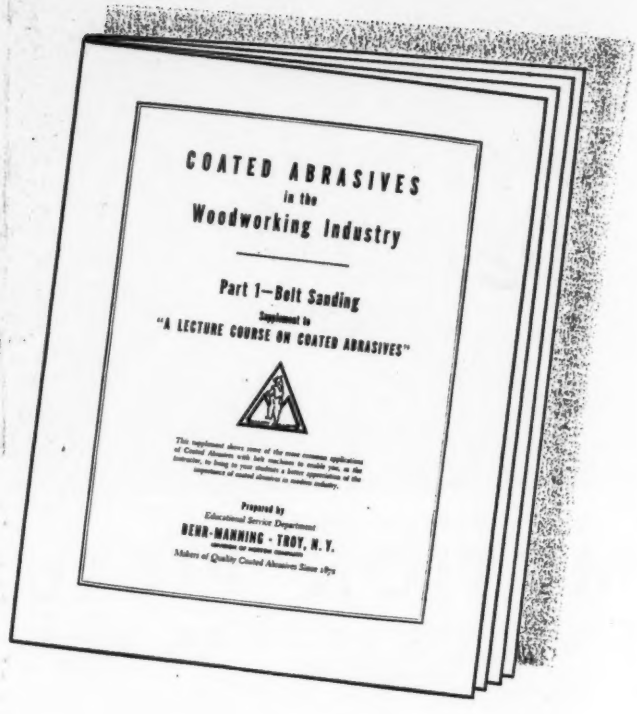

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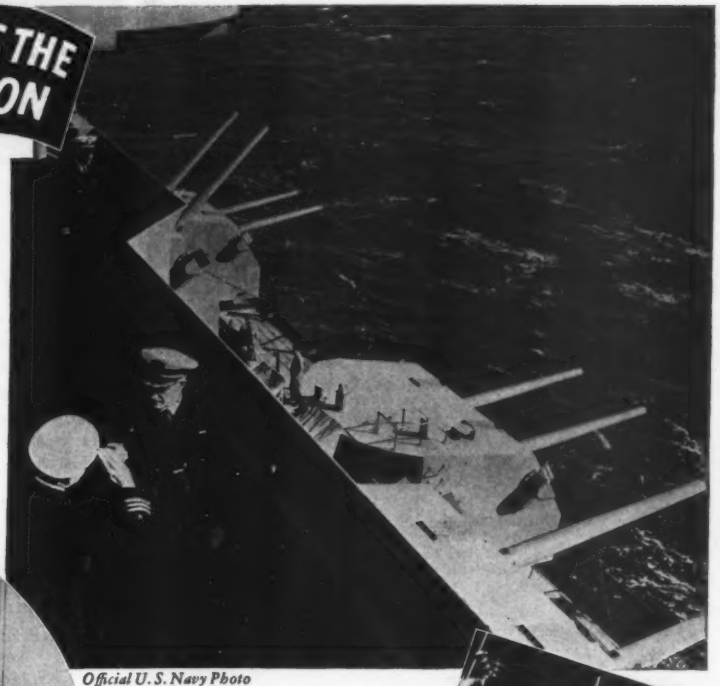

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Official U. S. Navy Photo

"EYES" for the Navy and Army — telescopes, binoculars, and marvelous range finders — the Bausch & Lomb Optical Company is doing yoeman service on defense production. The four photographs show some of the twenty-two Atlas 73 Drill Presses (18 on defense production) in the Bausch & Lomb plant. The workers are typical of those who since 1853 have carried on the tradition of precision machining.

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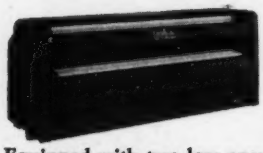
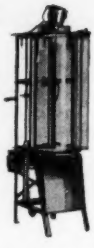


MODEL "3" . . . a handsome table model continuous printer especially designed for making blueprints or direct process prints, where a comparatively small quantity is needed, or as an auxiliary unit with larger continuous blueprinting machines. Equipped with two low pressure Mercury Vapor tubes and using sliding contact, an exclusive Pease feature, this continuous Printer has an actual printing speed of from 2 inches to 2 feet per minute. It is made in the 42" size only.



"JUNIOR" VERTICAL . . . the least expensive Blueprinting machine for the moderate user of blueprints, occupies a minimum of floor space and will make prints in one minute with only one drop of the arc lamp. It is mechanical throughout and consists of a half cylinder of glass, in a rigid framework, against which tracings and paper are held by means of a canvas curtain on a spring roller. Exposure is by means of a Pease Type P carbon arc lamp. Makes prints up to 24 x 36 inches in size.

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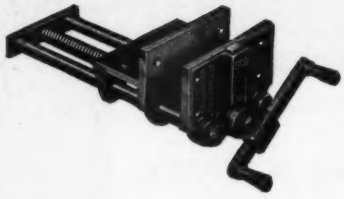

Columbian Continous-screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as opposite, to eliminate handle breakage, speed operation and provide extra leverage.

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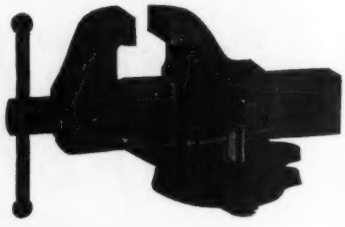

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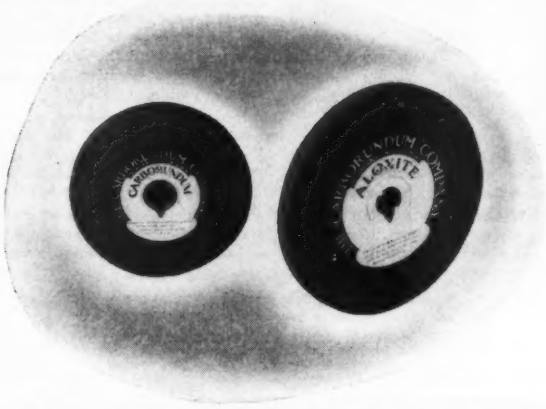

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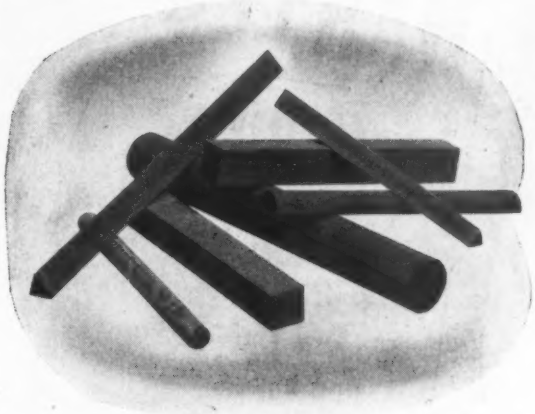

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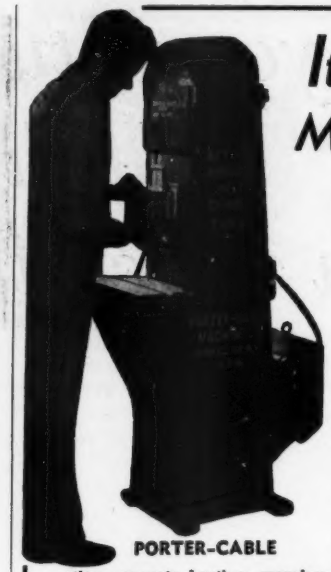

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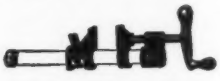

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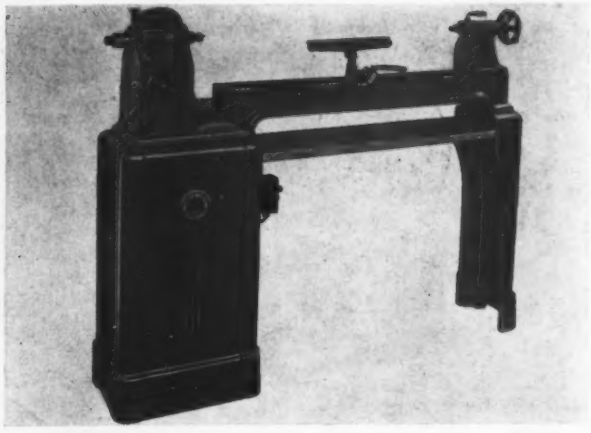

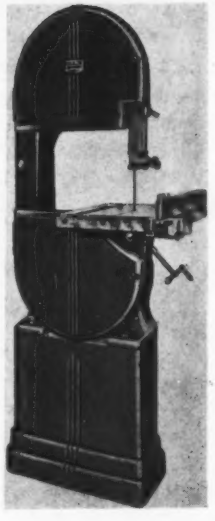

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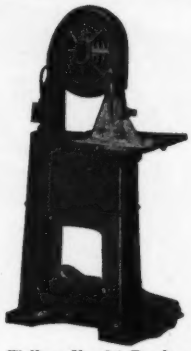
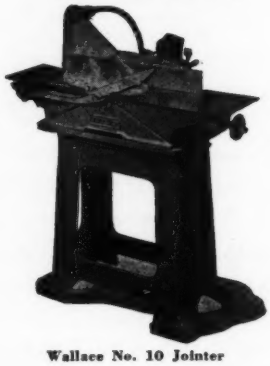


Wallace No. 16 Bandsaw



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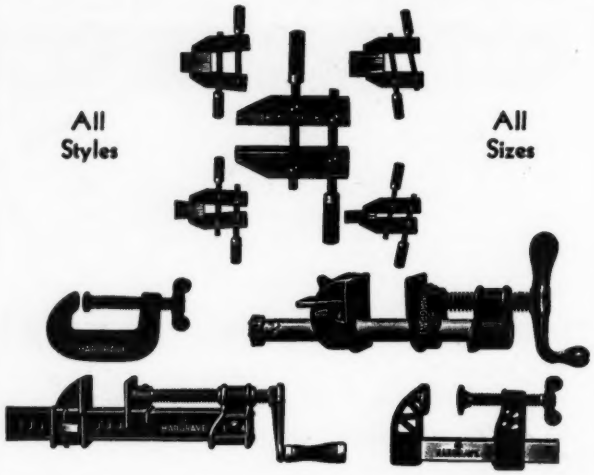

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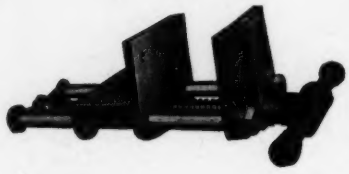

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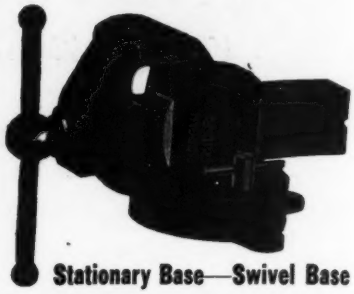

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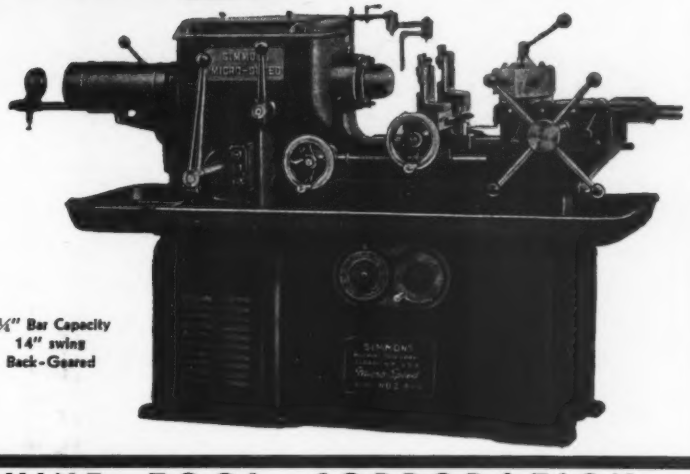

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The point of the file should be grasped by the thumb and first two fingers, the hand being so held as to bring the thumb, as its ball presses upon the top of the file, in line with the handle when heavy strokes are required. When a light stroke is wanted, and the pressure demanded becomes less, the thumb and fingers may change their direction until the thumb lies at right angle, or nearly so, with the length of the file—the positions changing more or less as may be needed to increase the downward pressure.

(See "do" and "don't" illustrations above.)

In holding the file with one hand, as in filing light work, pins, small dies, etc., the forefinger—instead of the thumb—should be placed on top and lying along the handle as nearly as possible in the direction of its length.

Drawfiling

"CARRYING" THE FILE. The most natural movement of the hands and arms is to "carry" (stroke) the file across the work in curved lines. This tends toward a rocking motion and, consequently, a convex surface where a level surface is desired.

For the usual flat filing the operator should aim to carry the file forward on an *almost* straight line—changing its course just enough to prevent "grooving."

KEEP THE FILE CUTTING. File teeth are designed to cut only on the forward stroke. Hence the pressure on the file should be relieved during the back stroke, otherwise the teeth will be subjected to excessive wear and possible damage.

LATHE FILING. The file should be stroked constantly against the revolving work. A slight gliding or lateral motion assists the file to clear itself of chips, and also avoids producing ridges or scores.

Lathe Filing

DRAWFILING. Drawfiling consists of grasping the file at each end and alternately pushing and pulling it across the work. A file with a short-angle cut should never be used for drawfiling, because of the likelihood of scoring or scratching instead of shaving or shearing. When properly done, drawfiling produces a somewhat finer finish than "straight" filing.

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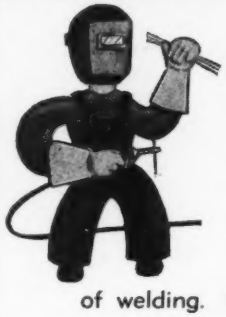

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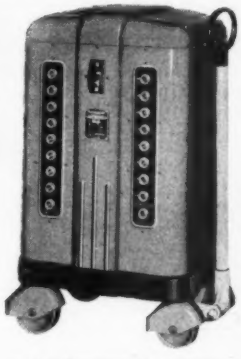

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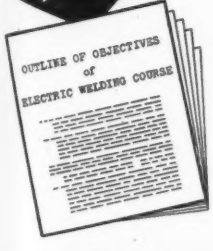

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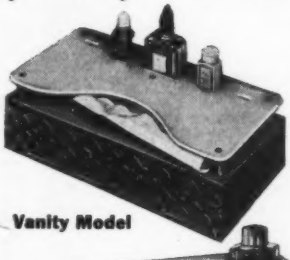

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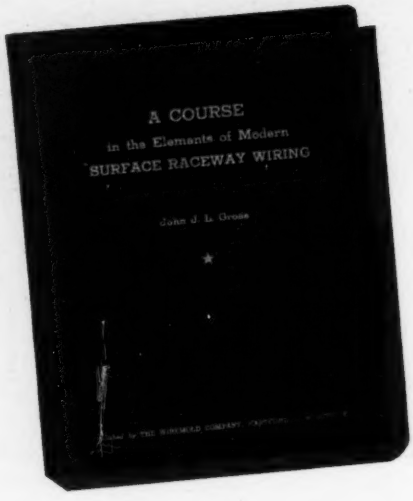

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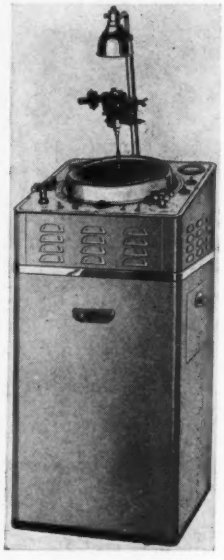

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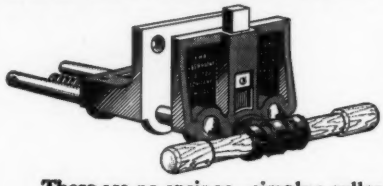

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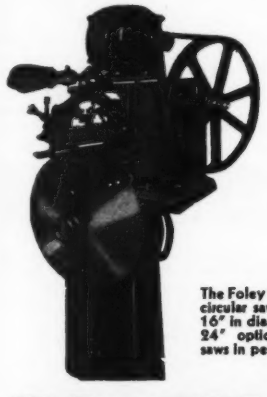

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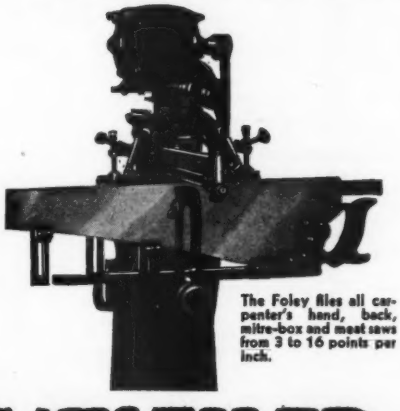
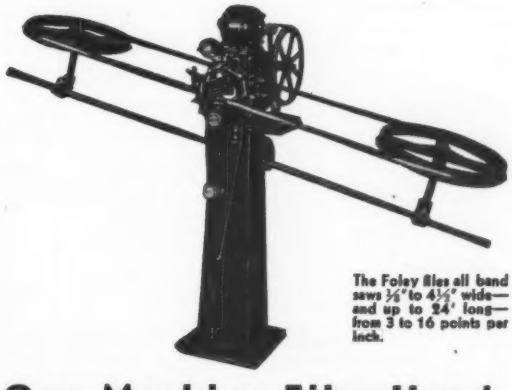


The Foley files all carpenter's hand, back, mitre-box and meat saws from 3 to 16 points per inch.



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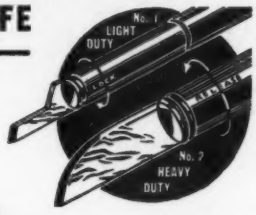

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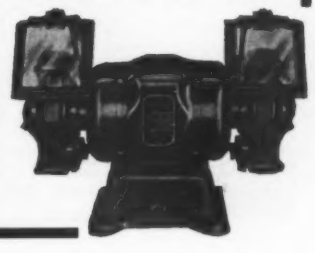

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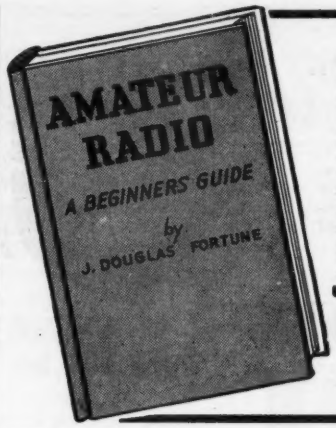

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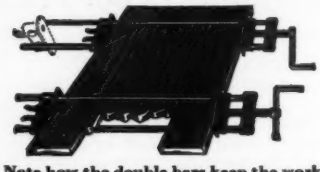

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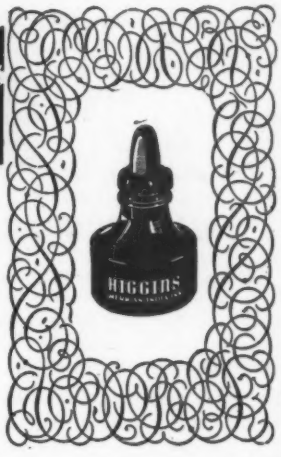

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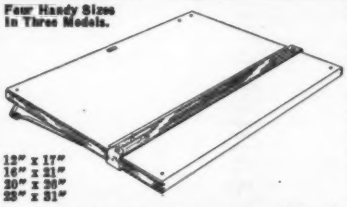

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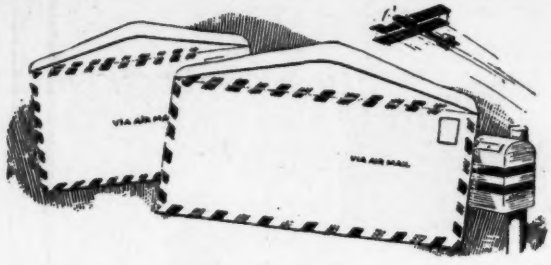

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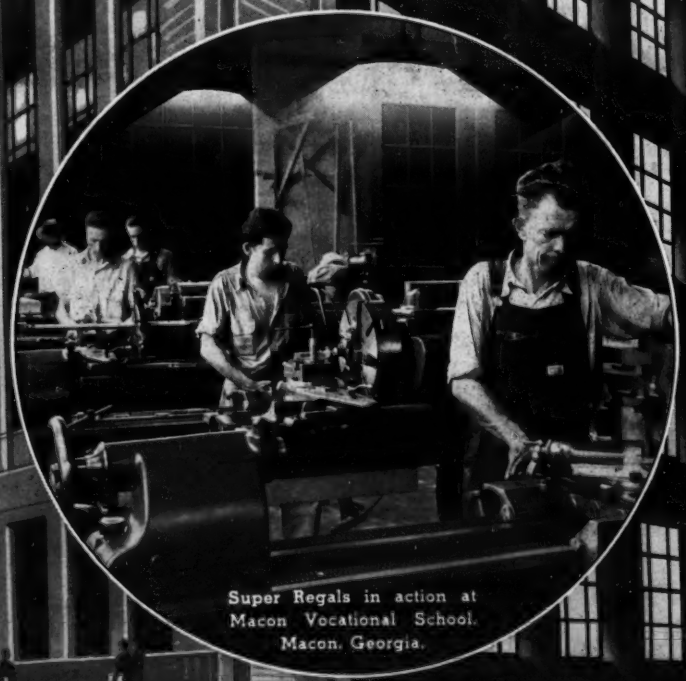

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